DIESEL PROGRESS

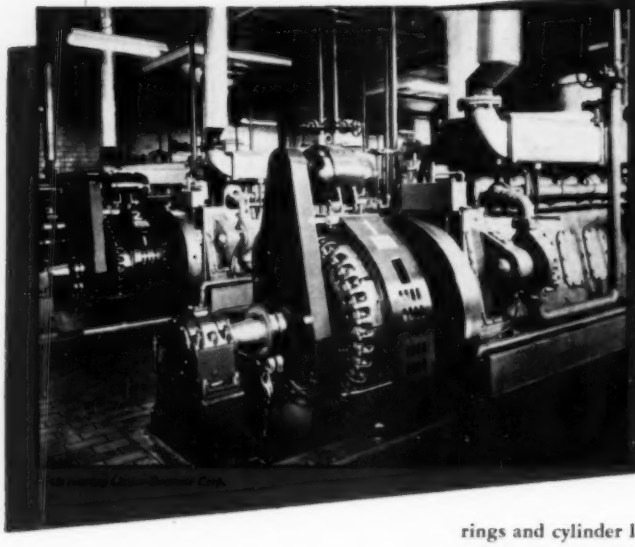
IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR • UNDERGROUND

FIVE DOLLARS PER YEAR

APRIL, 1949

FIFTY CENTS PER COPY

Maintenance costs and fuel consumption REDUCED



. . . when you lubricate with oils that keep your Diesels clean —Texaco Ursa Oils

DIESEL fuel consumption and maintenance costs stay impressively low when Diesels stay *clean* . . . and operators the world over *keep* their Diesels clean with *Texaco Ursa Oils.*

Texaco Ursa Oils stand up under heat and pressure, and resist oxidation. They keep engines free of harmful carbon, varnish and sludge, so valves stay active, ports open, rings free for proper seal. You get maximum power from every gallon of fuel . . . maximum life from bearings, pistons, rings and cylinder liners.

There is a complete line of *Texaco Ursa Oils.* Leading Diesel manufacturers approve them and operators everywhere use them. In fact—

More stationary Diesel hp. in the U.S. is lubricated with Texaco Ursa Oils than with any other brand.

Let a Texaco Lubrication Engineer help you get increased Diesel efficiency and economy. Call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 E. 42 St., New York 17, N.Y.

TEXACO

TEXACO Ursa Oils

FOR ALL DIESEL ENGINES

Tune in . . . TEXACO STAR THEATRE every Wednesday night starring Milton Berle. See newspaper for time and station.

DIESEL PROGRESS, for April, 1949. Volume XV, Number 4. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 W. Forty-fifth St., New York 19, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., authorized Mar. 27, 1940. Subscription rates: $5 per year, single copy 50c.

IN THE ENGINE ROOM IT'S DIESEL

A GM Diesel engine —Delco-Remy equipped—powers this cruiser. Delco battery in foreground.

ON THE DIESEL IT'S DELCO-REMY

Delco-Remy electrical equipment "teams up" with Diesel engines to give users dependable service.

There's a story of teamwork behind this combination. Delco-Remy works closely with Diesel engine manufacturers to make Delco-Remy electrical units right for the application. Since the early days of the Diesel industry, Delco-Remy has matched progress with progress.

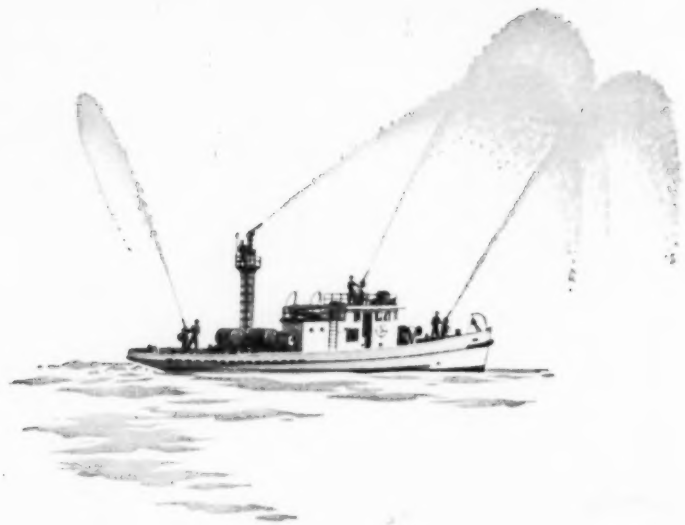
Diesel engine users and manufacturers respect the Delco-Remy name on electrical equipment. It's good assurance of good performance.

UNITED SERVICE MOTORS

DELCO-REMY—A UNITED MOTORS LINE
Service Parts and Delco Batteries
Available Everywhere, Through
UNITED MOTORS DISTRIBUTORS

Delco-Remy
DIVISION, GENERAL MOTORS CORPORATION
ANDERSON, INDIANA

DELCO-REMY • WHEREVER WHEELS TURN OR PROPELLERS SPIN



Shower of Power

Modern fireboats favor General Motors 2-cycle Diesel-Electric Drive for propulsion and pumping power. That's because they not only provide plenty of low-cost, dependable power for emergencies, but save valuable space for fire-fighting equipment by their compactness. It's also because they are backed by 37 years' Diesel engineering experience.

Outstanding Diesel Developments

A Winton Diesel engine was installed in a fireboat in 1926. This Winton Diesel was the forerunner of today's GM Diesels that power modern fireboats.

CLEVELAND DIESEL ENGINE DIVISION
CLEVELAND 11, OHIO
GENERAL MOTORS

GM
GENERAL MOTORS
DIESEL POWER

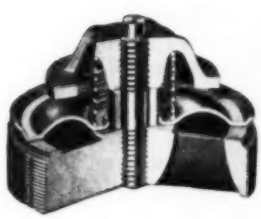
ENGINES FROM 150 TO 2000 H. P.

★ To Keep Reciprocating Pumps in Service Longer

★ To Guard Against Valve Failure

★ To Permit Long Term Maintenance Economy

DURABLA METAL PUMP VALVE UNITS*



1. Will Fit Any Reciprocating Pump, New Or Old

Adaptable as standard equipment or as replacement units, operating in any position or under rigorous space, weight, speed or load conditions. Available in eleven standard sizes machined to your order or supplied for your stock to be fitted as required.

2. Will Stand Up Under Any Pressure, Temperature, or Chemical or Abrasive Hazard

The Durabla arched construction metal valves are in service at pressures as high as 5000 pounds per square inch. Protective alloys permit operation at temperatures ranging from 800° F to extreme sub-zero conditions and give protection against corrosive fluids or gases, and suspended abrasive substances.

3. Will Contribute to Pump Efficiency

The light weight valve permits light spring loading, less power to open valves, no lag in valve opening and closing; slower speed operation at full capacity. The valve guard permits controlled lift, insuring minimum of slip, cavitation, or turbulence. The central valve stem insures no impedance to flow around the entire valve member. Freely mounted valve member can tip to adjust to natural flow lines.

4. Will Last Longer

The freely mounted valve member permits self grinding action and accommodation to wear on the valve seat. Valve spring is self cleaning and protected against wear due to touching of the coils. There are no wing guides or high hubs to cause friction, binding or stem breakage due to side pressure, no rubber to deteriorate or pick up suspended matter; a minimum stock is needed to fit all requirements; installation is simple and requires minimum shut-down time.

A pump valve seldom attracts attention until there is something wrong with it and when it causes trouble it causes serious trouble, expense or delay. The unique characteristics of DURABLA VALVES, summarized above, and illustrated in diverse applications in our DURABLA CATALOG 920, will give you effective and versatile insurance against pump failure.

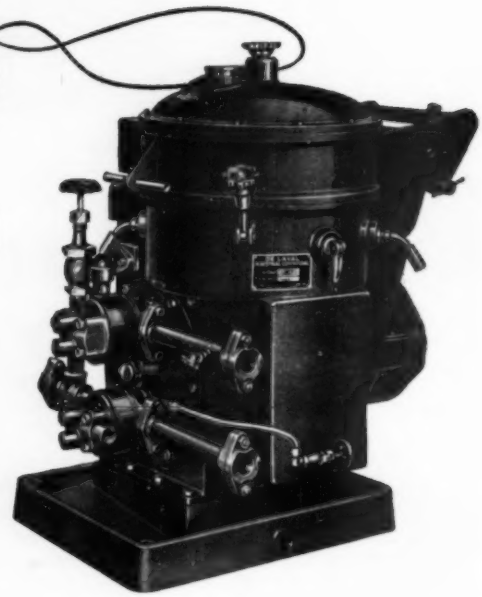
Address DURABLA Engineering Department for Information and Bulletin: Reference **9P4**

*Patent Numbers 2090486, 2117504

DURABLA MANUFACTURING COMPANY
114 LIBERTY ST. NEW YORK
BRANCHES IN PRINCIPAL CITIES. FOR CANADA REFER: CANADIAN DURABLA LIMITED, TORONTO

NEW

THE NO. 67 "UNI-MATIC" OIL PURIFIER for plants purifying 450-550 G.P.H. of lube or fuel oil



The De Laval No. 67 "Uni-Matic" Oil Purifier has a capacity of approximately 450 gph (Navy rating) when purifying turbine lubricating oil. When used to remove contaminants from Diesel lube or fuel oil, its capacity varies from 200 to 550 or more gph, depending on the grade of oil.

Now publicly announced for the first time, the "Uni-Matic" No. 67 has already proved itself on many installations in stationary power plants and in the engine rooms of ships at sea. A single, compact oil purifying unit, complete with pumps and heater, it provides exactly the same advantages common to the other three sizes of "Uni-Matic" Oil Purifiers. That is, it removes ***both*** of the chief contaminants of oil, ***water*** and ***dirt***. It provides complete protection to the turbine or Diesel engines whose bearings it safeguards or, when used on Diesel fuel oil, it makes it possible to obtain the maximum BTU value of the oil.

• Ask for additional details on the No. 67 "Uni-Matic."

De Laval

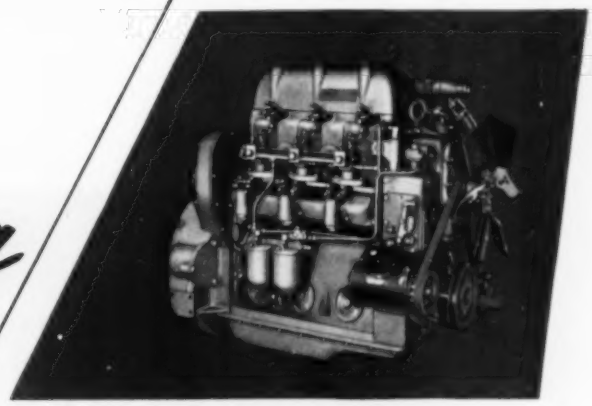
THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

LUBRICATING OIL PURIFIERS

Announcing the New

P&H DIESELS

2 CYCLE



Model 387-C 3 cylinder

Model 687-C 6 cylinder

Built for the toughest job known

Now — the new P&H Diesels are ready — after years of intensive research, development and testing in the most grueling of diesel applications — excavator service.

The new P&H Diesels introduce a number of advancements in design — in performance — and in easier servicing — which will be welcomed in many fields of diesel usage, mobile, stationary and marine.

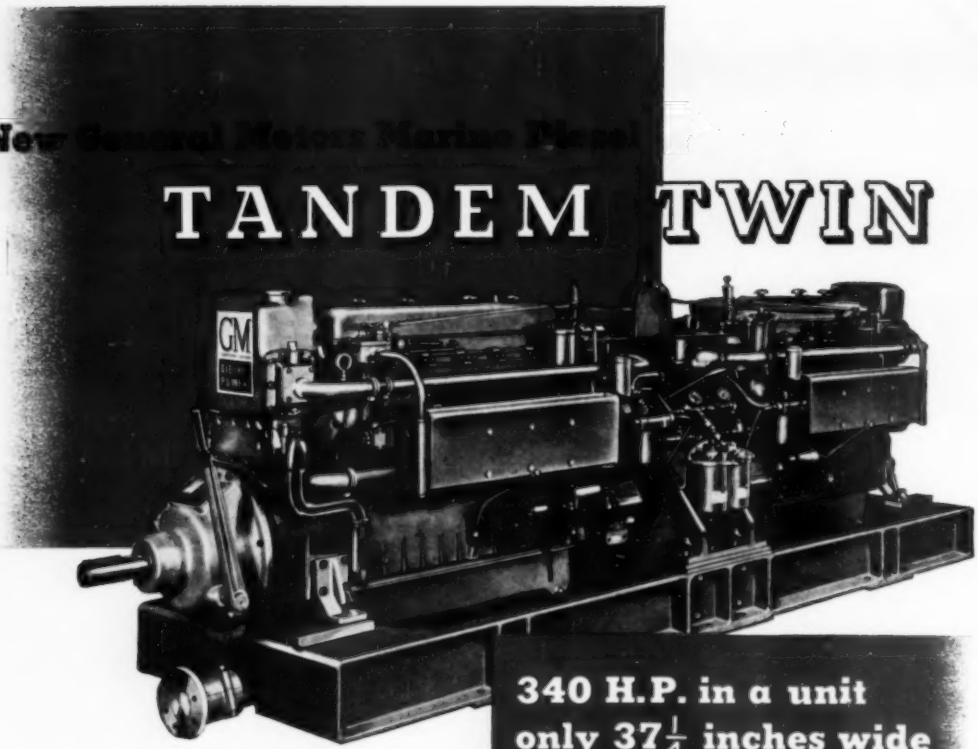
Literature is now available. Address Harnischfeger Corporation, Diesel Division, Port Washington, Wisconsin.

P&H DIESEL DIVISION HARNISCHFEGER CORPORATION

EXCAVATORS · ELECTRIC CRANES · ARC WELDERS · P&H · HOISTS · WELDING ELECTRODES · MOTORS

New General Motors Marine Diesel

TANDEM TWIN



340 H.P. in a unit only 37 1/4 inches wide

Here's another great development in GM Diesel multiple engine design for single or twin-screw propulsion.

The Tandem Twin provides a maximum of 340 H. P. or 260 continuous heavy duty SHP in a workboat at 1600 R. P. M. It consists of two Series 71 Diesel "sixes" mounted end to end on a common base and driving a single shaft through individual clutches. As in all GM Diesel multiple units, either engine can be de-clutched and shut down while the other carries on, providing maximum flexibility.

This compact, space-saving power package makes big horsepower available to a wide variety of hulls including twin-screw boats of limited beam. It is available in port or starboard models. Choice of reduction ratios from 1.75:1 to 6:1. Front power take-off available for either engine.

Built with the new GM hydraulically operated reverse gear as an integral part of the unit, the Tandem Twin is easy to install, easy to take care of. Even in narrow beam boats it allows space on either side for ease in cleaning and servicing. All working parts are readily accessible.

Regardless of the size or type of your boat, there's a GM Marine Diesel to fit your application. Choose from "Singles," "Twins" or "Quads"—44 to 800 horsepower. For all the interesting details, call your local GM Diesel dealer or drop us a line.

DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES...Up to 200 H.P. **DETROIT 28, MICHIGAN** MULTIPLE UNITS...Up to 800 H.P.

GENERAL MOTORS

DIESEL BRAWN WITHOUT THE BULK

GM GENERAL MOTORS DIESEL POWER

You'll transfer more BTU's per dollar invested...

...than with any other exchanger

● Embodying highest standards of construction, longer-lasting nonferrous materials and latest developments in thermal engineering, the fully standardized Ross "BCF" Exchangers offer industry a new low cost for high heat transfer efficiency.

Oil and water cooling, water and process heating or vapor condensing requirements can now be met by units carried in stock as shelf goods at the Ross plant. The needs of *most* have been interpreted and placed into mass production. Low unit costs, which mean more BTU's transferred per dollar, await chemical, process, hydraulic machinery, Diesel, food, petroleum, paper, power, textile, metal and a host of other industries.

This coupon, filled in and mailed, will bring the complete "BCF" story to your desk.

ROSS

"BCF" EXCHANGER

Ross Heater & Mfg. Co., Inc.
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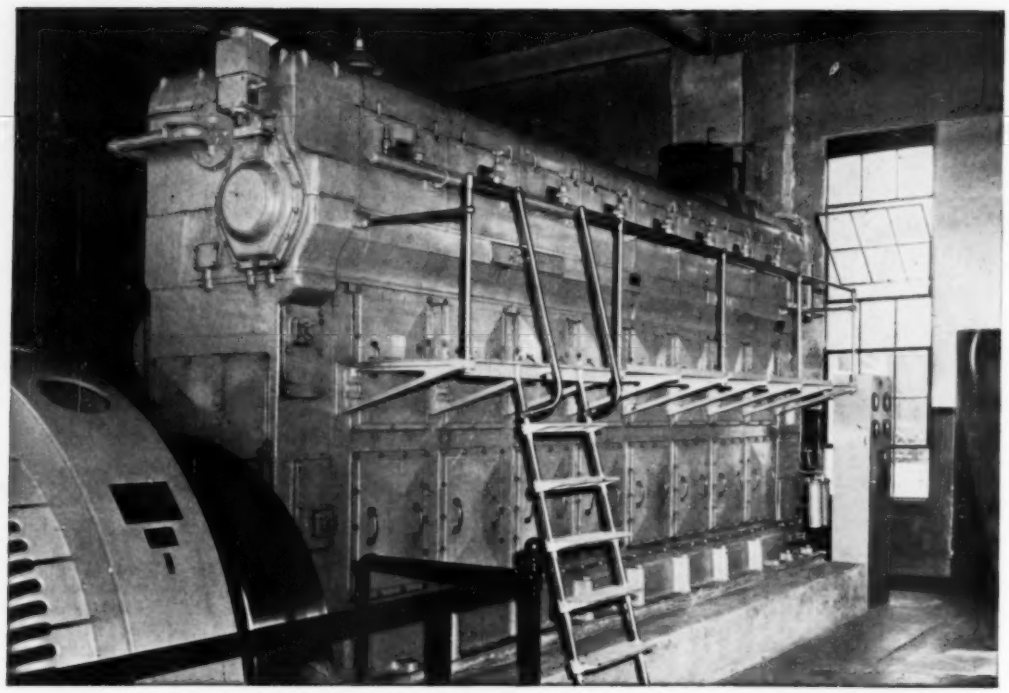
Division of American Radiator & Standard Sanitary Corporation — ROSS HEATER & MFG. CO., INC. — Represented in Canada by Horton Steel Works, Ltd., Fort Erie, Ontario

Serving home and industry

AMERICAN STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILER • ROSS HEATER • TONAWANDA IRON



THERE'LL BE SOME CHANGES MADE

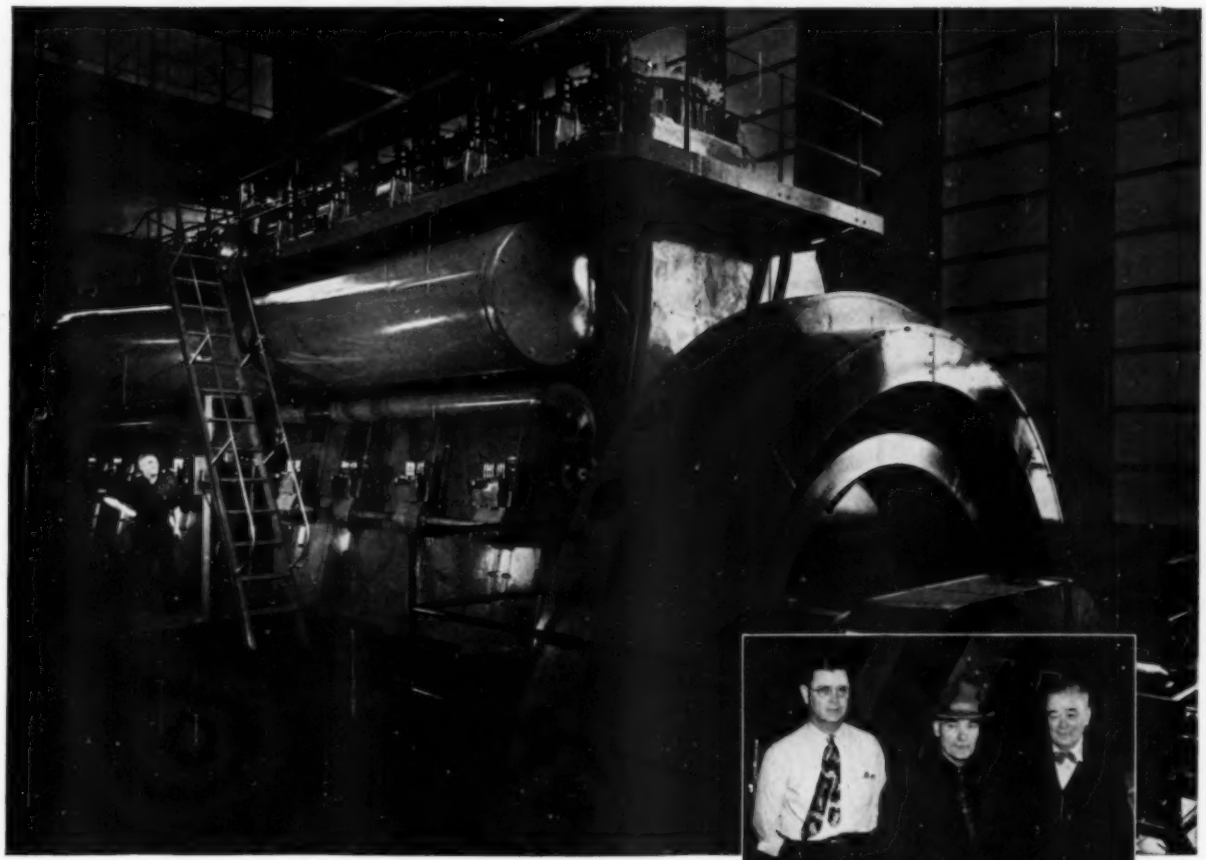
Many communities and industries, located near a source of natural gas, are getting lower cost electric power with dual fuel Superior Diesel Engines. The dual fuel feature offered by Superior enables them to burn low cost gas in the summer and switch to oil in winter when gas is in short supply. Superior . . . the first Diesel with push-button control of fuel selection permits you to change from oil to gas, or gas to oil instantly . . . with just a flick of a finger.

There are many other Superior operating economies that are due to the following features: Conservative Ratings • Fuel Economy • Precision Bearings • Heavy Rigid Crankshafts • Strong Bases and Cylinder Blocks • Proved Roller Chain Camshaft Drive • Oil Cooled Pistons. One of our field engineers will be glad to show you the advantages of these features, or we will be glad to send you a fully illustrated booklet.

THE NATIONAL SUPPLY COMPANY
SUPERIOR ENGINE DIVISION
Plant and General Sales Office: Springfield, Ohio

THE NATIONAL SUPPLY COMPANY NSCO

Superior DIESEL



Directly responsible for the installation and operation of this large Nordberg engine, are Mr. John M. Drabelle (right), Electrical and Mechanical Engineer, Mr. H. C. Kullander (left), Resident Engineer of the Iowa Electric Light and Power Company, and Mr. Louis Bonaventure (center), Chief Engineer of the Marshalltown plant.

This new 7,100 hp giant uses

NONPAREIL HD
DIESEL OIL

The 7,100 HP Nordberg Diesel engine recently installed at the Marshalltown, Iowa, plant of the Iowa Electric Light and Power Company is the largest single-acting, solid-injection engine in stationary service in the United States. The ten cylinders in this engine have a 29-inch bore and 40-inch stroke.

Nonpareil HD was selected for cylinder lubrication because it is a superior, heavy-duty oil with excellent detergent qualities and will stand up under high temperatures and prevent the formation of piston and ring deposits.

These are qualities that help reduce maintenance on any type of Diesel, large or small. A Standard Oil Lubrication Engineer can give you many more reasons why you'll find it profitable to switch to Nonpareil HD. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Ill.

STANDARD OIL COMPANY (INDIANA) STANDARD

Straight-Flow Port Design reduces fluid turbulence to a practical minimum.

Seat Rings of end-seated type are screwed into the body.

Sure-Grip Malleable Handwheel for non-skid gripping even with heavy gloves.

Brass Liner on Glands assures greater resistance to corrosion and scoring.

WALWORTH

iron body gate valves

with screwed or flanged ends

... 8 Outstanding Features

For complete information on these new Walworth Iron Body Valves, see your local Walworth distributor, or write for bulletin 106.

WALWORTH

valves and fittings

60 EAST 42nd STREET NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

T-head Disc-to-Stem connection on OS&Y types provides stronger connection, prevents loosening of disc by corrosion.

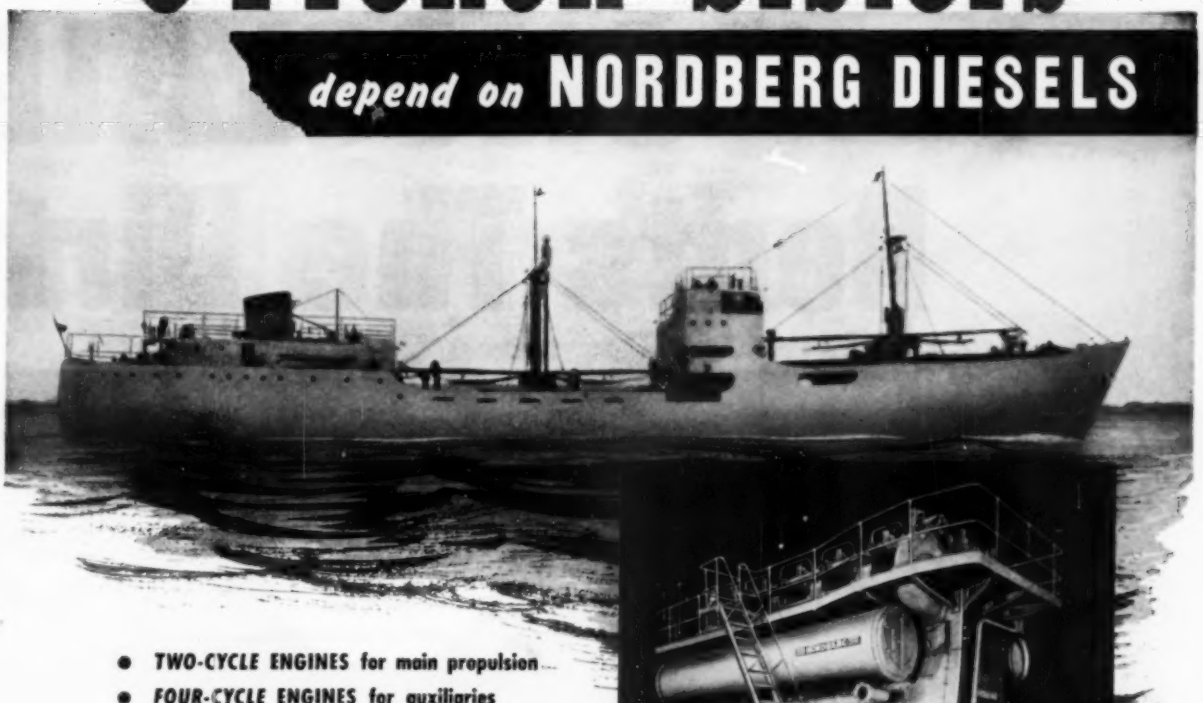
Bronze Back-Seat Bushings in bonnets of OS&Y valves.

Solid Web Type Disc in OS&Y valves for greater strength and longer service.

Hinged Gland Eye-Bolts on OS&Y valves permit faster, easier repacking under full pressure.

6 French "Sisters"

depend on NORDBERG DIESELS



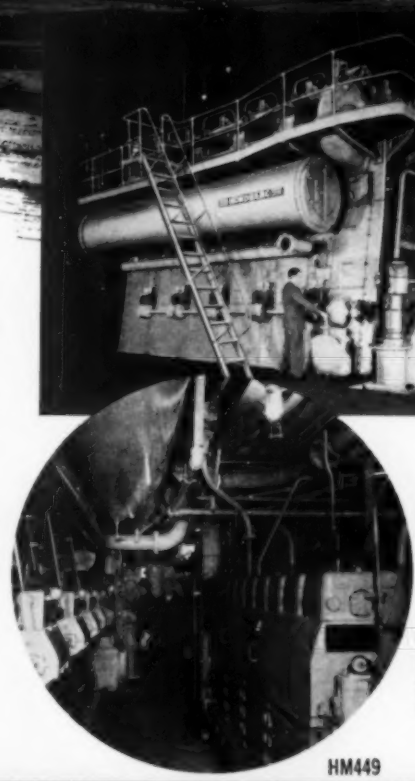
- **TWO-CYCLE ENGINES for main propulsion...**
- **FOUR-CYCLE ENGINES for auxiliaries**

This 2600 ton motor cargo vessel, the *CAP CAPET*, is one of six sister ships built by Marine Industries Ltd. in Canada for the French Mission of Shipping. Each vessel is single-screw propelled by a 5-cylinder, 2-cycle Nordberg direct reversing Diesel engine developing 3100 S.H.P. at 150 R.P.M. In addition, each vessel carries two 4-cycle Nordberg 8-cylinder supercharged 400 K. W., DC auxiliary generating units.

Whether you require an engine for direct or reduction gear drive, as a single or multiple engine arrangement, the extensive line of two and four-cycle Nordberg Marine Diesel Engines permits the selection of the type of unit best adapted to the service. Available for main propulsion or auxiliary service in sizes from 10 to 8500 S.H.P.

Write for descriptive literature.

NORDBERG MFG. CO.
Milwaukee 7, Wisconsin



ABOVE: Five-cylinder, 29" x 40" Nordberg two-cycle Diesel Engine developing 3100 S. H. P. at 150 R. P. M., used for main propulsion on board the CAP CAPET and five sister ships.

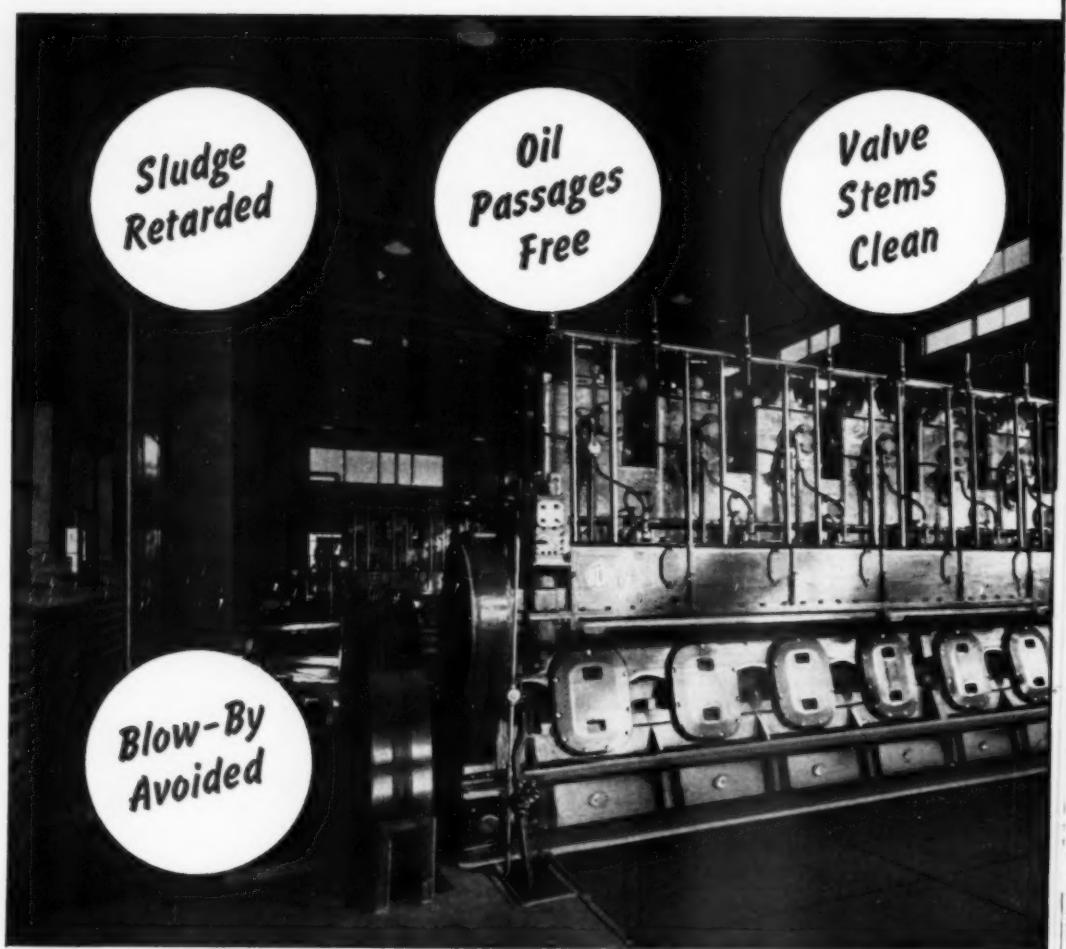
LEFT: Engine room view showing portion of Nordberg main engine and one of two 8-cylinder Nordberg Diesel generating units.

HM449

A DIVISION OF NORDBERG

NORDBERG
DIESEL ENGINES

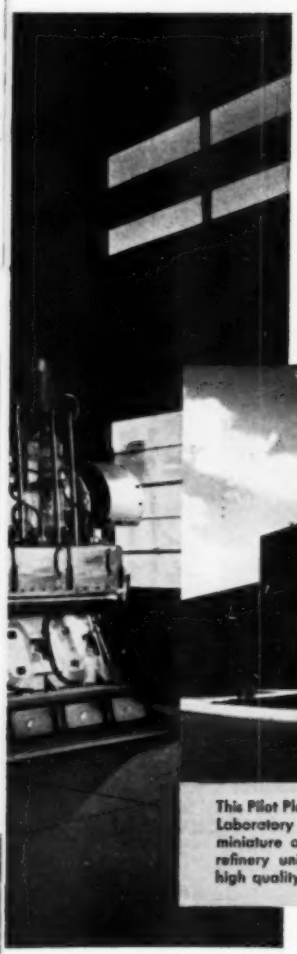
SINCLAIR Beats The Dirty



SINCLAIR

YOUR NEAREST SINCLAIR AGENT WILL GLADLY ARRANGE

GASCON Engine Problem



Diesel engineers know that engines fouled with sludge and varnish do not produce full power . . . and require frequent maintenance service.

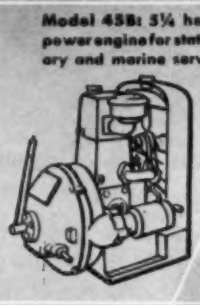
When Sinclair GASCON is the lubricant, sludge and varnish worries are relieved. Engines are kept clean with GASCON. Its natural solvent properties retard the formation of deposits and accumulation of sludge. By protecting against sluggish valve action and keeping piston rings free to provide positive seal, full power output can be attained while maintenance is kept at a minimum level. Try Sinclair GASCON.

This Pilot Plant, part of the great Sinclair Research Laboratory at Harvey, Ill., provides space for six miniature operating replicas of commercial-sized refinery units. Continuous research explains the high quality of GASCON and other Sinclair Oils.

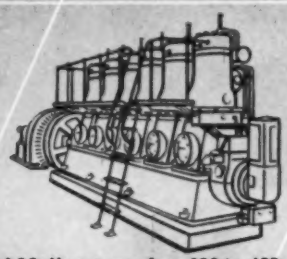
Making a study of crystal structure of catalysts, this Sinclair researcher at Harvey uses physical chemistry to develop refinery techniques in a never ending effort to bring industry better petroleum products at lower costs.

INDUSTRIAL OILS

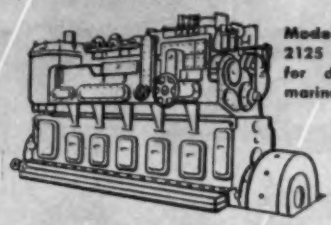
FOR LUBRICATION COUNSEL, OR YOU MAY WRITE TO SINCLAIR REFINING COMPANY, 630 FIFTH AVE., NEW YORK 20, N. Y.



Model 45B: 5¼ horsepower engine for stationary and marine service.

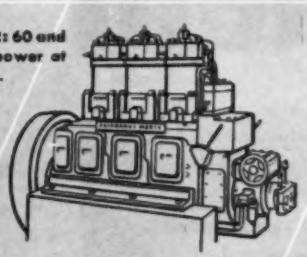


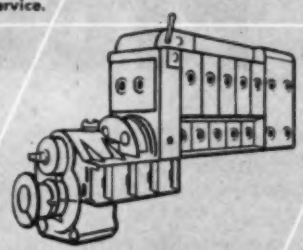
Model 32: Horsepower from 120 to 450. For slow-speed heavy-duty service.



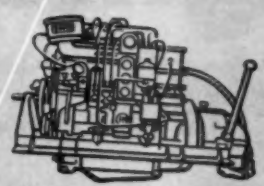
Model 37: 300 to 2125 horsepower for direct drive marine service.

Model 42: 60 and 90 horsepower at 450 r.p.m.

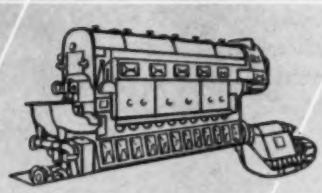




Model 31: Horsepower from 175 to 500; with 2 to 1 reduction gears optional for marine service.

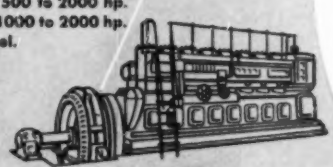


Model 48 Marine Engine: Also available for stationary or portable service. 3.5 to 80 hp.



Model 38 Opposed-Piston Engine: Horsepower from 960 to 1920 with 2 to 1 reduction gear for marine service.

Model 33 Stationary Engine: 500 to 2000 hp. Diesel, 1000 to 2000 hp. Dual Fuel.



When it comes to Diesel Power . . .

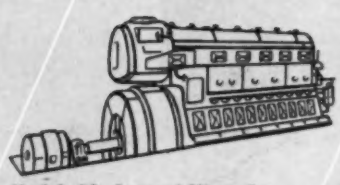
From 3.5 hp. to 3500 hp.

Low-cost, efficient power for all marine services . . modern, dependable power for newest, fastest road locomotives . . economical power for largest to smallest municipal and industrial plants . . Fairbanks-Morse is the proved source for the full range of diesel applications. For skilled assistance and impartial recommendation for the diesel for your specific service, write Fairbanks, Morse & Co., Chicago 5, Ill.

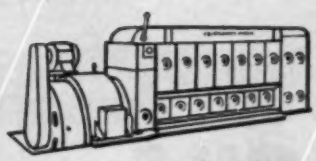
FAIRBANKS-MORSE

A name worth remembering

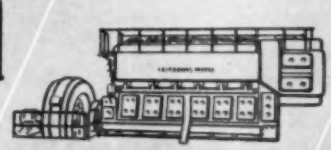
DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES
MOTORS • GENERATORS • STOKERS • RAILROAD MOTOR
CARS and STANDPIPES • FARM EQUIPMENT • MAGNETOS



Model 38 Opposed-Piston Engine: 960 to 1920 horsepower at 720 r.p.m.



Model 31: Diesel generating set with kw. ratings from 118 to 360. Marine and stationary—Dual Fuel available in larger sizes.



Model 31: 2100 to 3500 horsepower diesel or dual fuel engine for heavy-duty stationary service.

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GULFPRIDE DIESEL the world's finest Diesel Oil — Alchlor-processed

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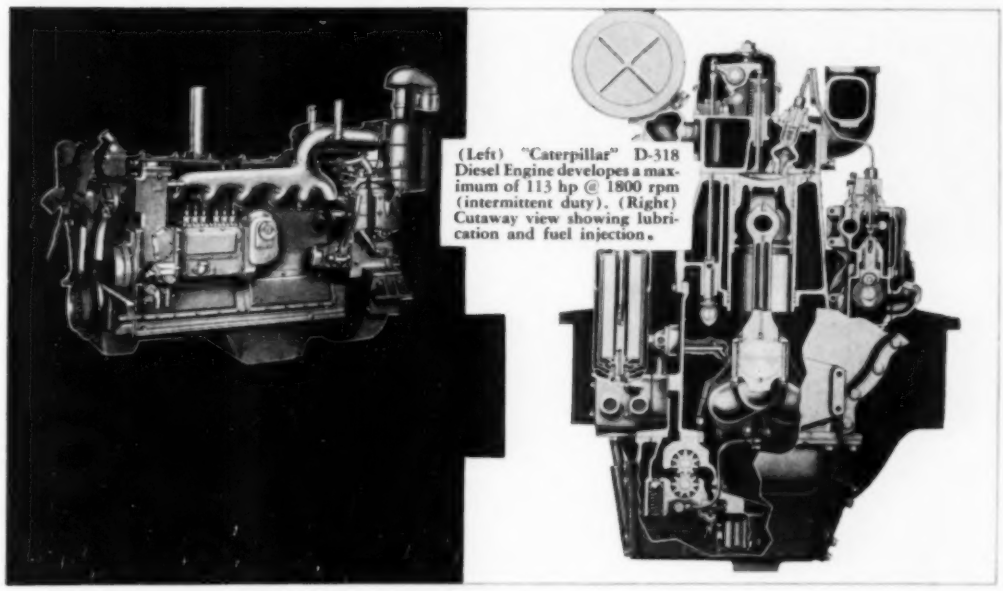

(Left) "Caterpillar" D-318 Diesel Engine developes a maximum of 113 hp @ 1800 rpm (intermittent duty). (Right) Cutaway view showing lubrication and fuel injection.

This is the second of a series of ads featuring well known high-speed Diesel engines. The manufacturer of "Caterpillar" Diesel engines approves of these two motor oils, among other high quality lubricants offered by the petroleum industry.

Gulfpride-Diesel, the world's finest Diesel Oil, is superrefined by Gulf's exclusive Alchlor Process, an extra refining step that discards as much as 15% of a conventionally refined oil. This 15% contains the hydrocarbons most apt to oxidize during engine operation to form sludge, varnish, and other objectionable engine deposits.

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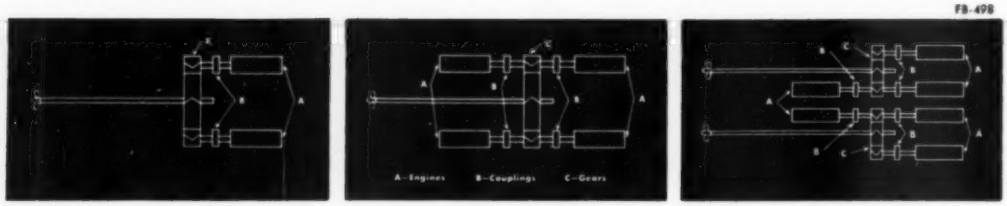

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Cummins-Powered rigs of the McLean Trucking Company, Inc., Winston-Salem, N. C., cover the East from Georgia to Massachusetts. It's the largest Cummins fleet in the world.
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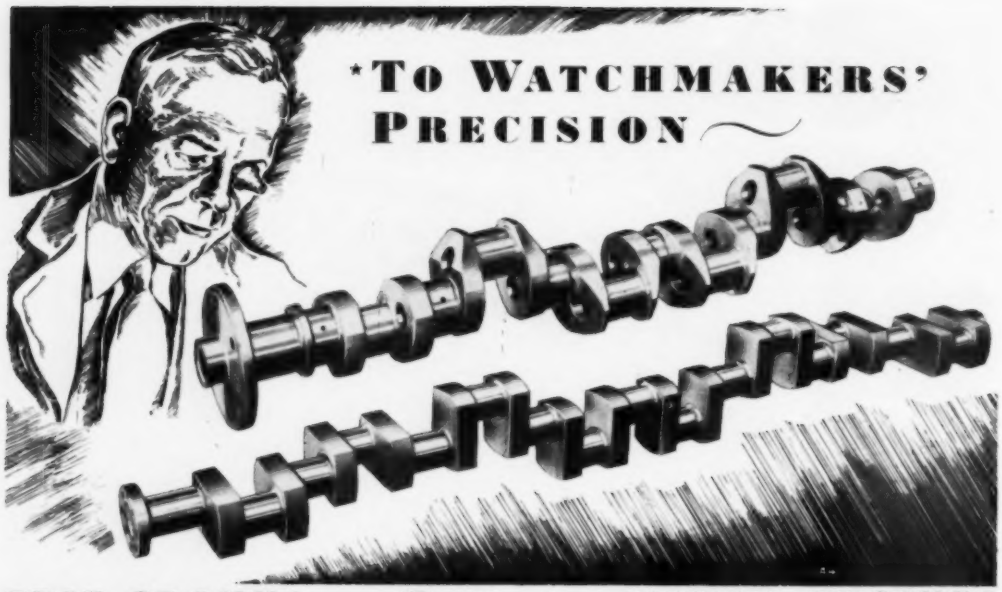

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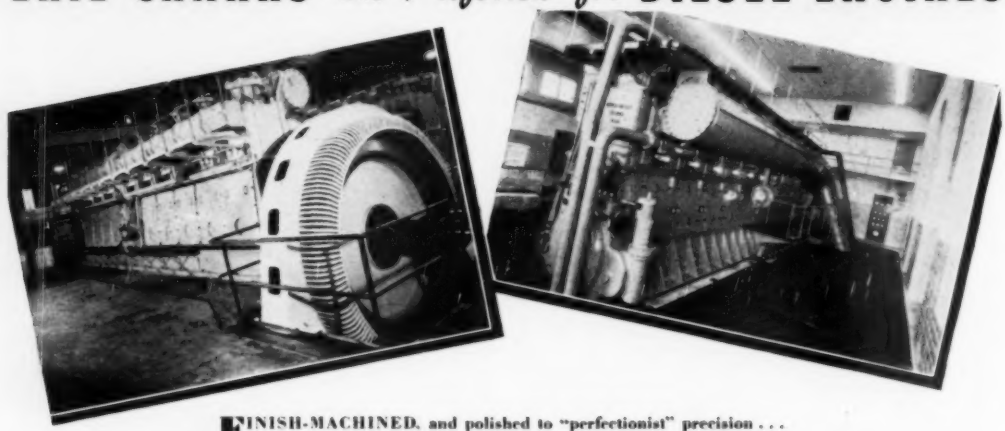


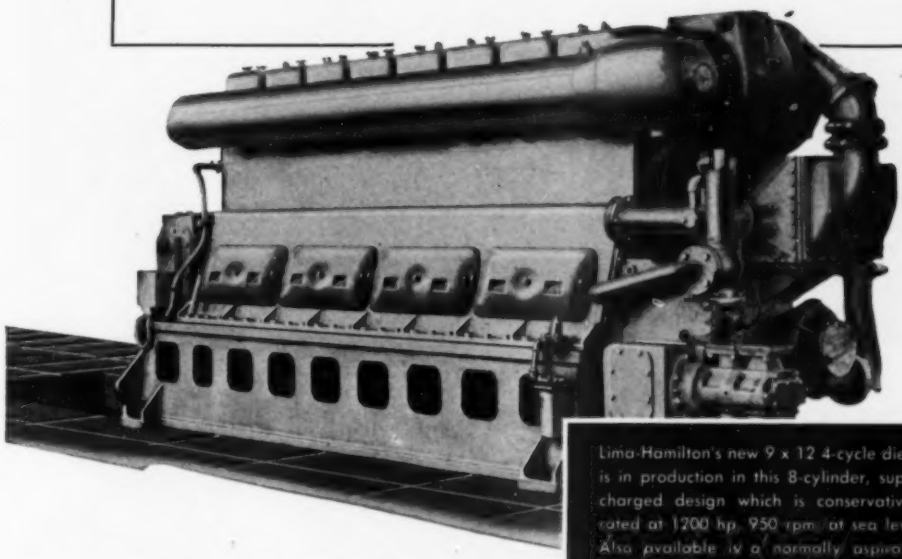
FINISH-MACHINED, and polished to "perfectionist" precision . . . tough, rugged Erie Diesel Cranks of all sizes are doing heavy duty daily in every kind of diesel engine service for utilities, in industrial plants, on the rails, and in marine service. Erie Forge believes in *one responsibility* and *one control* from ingot to jewel-like finished crank. Erie engineers and craftsmen supervise, direct and complete each operation within one plant . . . Another reason why Erie is the preferred source of supply for rugged, sturdy, diesel shafting . . . Steel Castings, Connecting Rods and drive shafts to specifications are regular production at Erie Forge Company. *Consult with us!*

You'll want to know more about

LIMA-HAMILTON'S

NEW 9 x 12

. . . a diesel worth watching



Lima-Hamilton's new 9 x 12 4-cycle diesel is in production in this 8-cylinder, supercharged design which is conservatively rated at 1200 hp. 950 rpm. at sea level. Also available is a normally aspirated engine — and in six-cylinder design.

Here is an engine that's so new, so advanced in its design, that we confidently believe it will set the pace for future medium-sized diesels. It operates at higher pressures, it develops more horsepower per pound — by substantial margins. And it does so with a higher than average factor of safety.

A most interesting feature of this new engine is its intercooler — which cools the supercharging air as it enters the engine. This has made possible the higher supercharge and higher cylinder pressures without excessive temperatures — which of course accounts for the unusually high specific output. The welded steel block, furnace stress relieved — the oversize forged-alloy crankshaft — and all other working parts are more than equal to the high BMEP at which this engine operates. All ratings, including the 1200-hp output of the supercharged, 8-cylinder design, are most conservative both from thermodynamic and from structural standpoints.

All who have seen this engine have been impressed with the consideration given to maintenance in its design. Every part requiring routine inspection or attention is readily accessible. For example, any of the shells of the nine main bearings can be removed for inspection through the crank pit covers. Connecting rods can be removed without removing liners. Heads can be tightened without removing valve gear.

It all adds up to this: If you're considering a diesel in the medium-size range, you'll want to know more about this new 9 x 12. We will give you prompt specific answers to all questions. Write to Lima-Hamilton Corp., Hamilton, Ohio.

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DIVISIONS: *Hamilton, Ohio—Hooven, Owens, Rentschler Co.; Niles Tool Works Co. Lima, Ohio — Lima Locomotive Works Division; Lima Shovel and Crane Division. Middletown, Ohio — United Welding Co.*

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Alcoa's 61 years of light metal experience and technical knowledge back these sound, high-quality castings. Leading bearing manufacturers finish and supply them.

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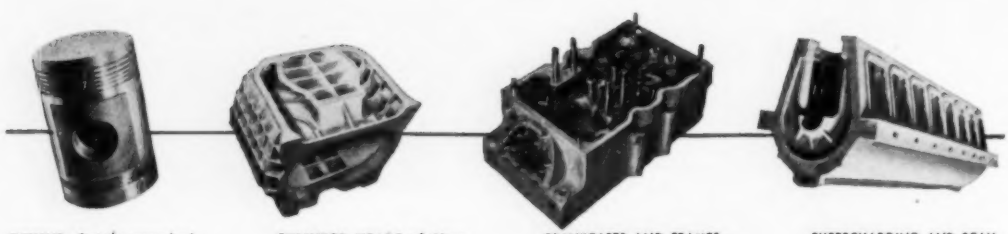

PISTONS—Get the proved advantages you've enjoyed in Alcoa Aluminum Pistons, in these other diesel parts.

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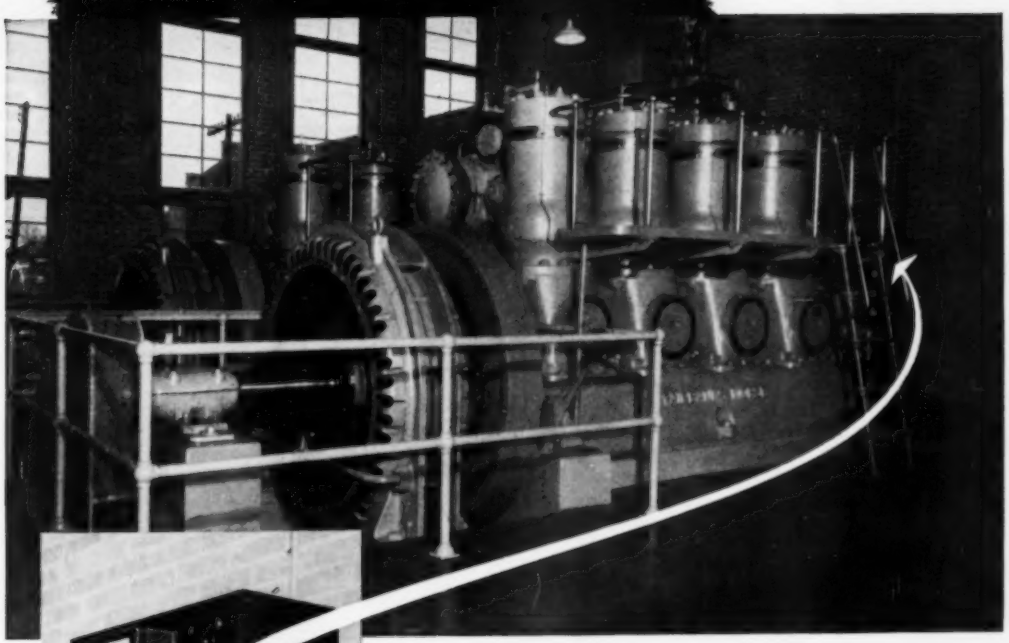
CRANKCASES AND FRAMES—the lighter weight of crankcases and frames of Alcoa Aluminum gives your diesel a higher horsepower-weight ratio.

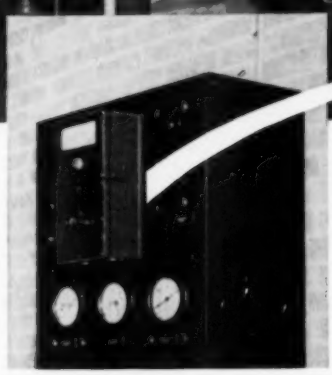
SUPERCHARGING AND SCAVENGING are more efficient through the use of aluminum. Here, too, diesels can save weight with Alcoa Aluminum.

ALCOA ALUMINUM

MAKE GOOD D[illegible]

Guarding the Profits





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HERE'S a diesel-powered electric light and power plant that brings first-rate service and first-rate profits to its town. And every second of its operation is guarded by Alnor Exhaust Pyrometers.

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FRONT COVER ILLUSTRATION:

One of the greatest concentrations of oil wells in the U.S. adjoins the railroad depot at Kilgore, Texas. A diesel powered freight train going by the source of its fuel is unique photographic timing to say the least.

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Peter B. B. Andrews, industrial economic expert

TOP RATING FOR DIESEL INDUSTRY IN NEXT 12 MONTHS

☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆ *By* PETER B. B. ANDREWS* ☆ ☆

Editor's Note: We hope that every reader of DIESEL PROGRESS will read this outstanding contribution by Mr. Andrews in which he states and then proves that the diesel industry is today a five-star industry, that the prospects for the diesel industry in the immediate future are better than they have been since the end of the war. Mr. Andrews gives facts and figures which are incontrovertible – facts and figures which history will prove accurate to an uncanny degree.

The engine builders, the accessory equipment builders, the diesel engine salesmen and the accessory engine salesmen who read this article should clip it out and use it in their day by day activities. Some industries may be going through a readjustment period, some industries have already reached their top in production and sales are on the way down. That is not true of the diesel industry.

We are just beginning to hit our stride and 1949 is going to be tops, and then 1950 is going to beat 1949. Nevertheless, despite the activity that now exists in the diesel industry, the weak and poorly managed companies, both among the engine builders and among the accessory manufacturers, have either cancelled their advertising entirely or materially reduced it. They have reduced their selling forces to a skeleton of what they used to be and these companies are going to pay and pay bitterly for their lack of judgment and lack of alertness. On the other hand, the strong and well managed companies among the diesel engine builders and the accessory manufacturers have stepped up their advertising program appreciably, have in some cases as much as doubled their selling forces and these are the companies and the men who are going to cash in on this five-star diesel industry of ours.

Again we say to you, read this article by Peter B. B. Andrews. It is the most constructive, provocative article we have ever run in DIESEL PROGRESS.

THERE is hardly a major industry in the United States that has so clear-cut a favorable prospect for both the near future and longer future as the diesel engine industry. Backlogs of orders in this industry including potential orders where selling is required to crystallize the desire into an order, is estimated after extensive studies by the writer, to approximate $3,500,000,000—enough to keep the industry booming far past the next decade.

Considering this prospect, it is not difficult to realize why the rating of five stars is given the diesel engine industry by Future Sales Ratings, nationally known rating service which covers the 97 leading American industries. That is the highest rating any industry can get, and according to the standards of Future Sales Ratings, it signifies considerably greater activity in the diesel industry over the next twelve months.

Future Sales Ratings are prepared by a group of over 100 industrial and Government experts, under the author's direction, and the findings are published quarterly in *Sales Management*.

While it is true that the next 12 months for business as a whole may not be as prosperous as the 12 months past, the diesel engine industry is expected to make a greatly better showing than business as a whole, reflecting the increasing fundamental demand for economy and efficient operation in such industries as railroads, trucking, passenger transportation, farming, construction, shipping, petroleum production, logging, road building, basic industrial power, air conditioning, mining, irrigation, quarrying, and central and municipal plants.

Demand from railroads is practically insatiable; in 1949 railroads should take about 1,250 locomotive diesel engines, compared with about 900 such engines in 1948. Truck diesels this year probably

* *Former Industrial Economic Advisor, War Production Board.*

will reach total sales of about 9,000, vs. 8,200 in 1948, while bus diesel engines will register a larger relative increase—from 7,000 in 1948 to approximately 9,000 in 1949.

Farm demand for machinery—particularly diesel-powered—continues great, and even though farm income in the aggregate will be lower this year than it was last year, more diesel tractor engines will be sold to farmers—probably around 75,000, compared with an approximate 65,000 total in 1948. Farmers will be more economy-minded this year and their natural interest in diesels will be further enhanced.

In spite of the comparative slowness of shipping, marine engines continue in heavy demand, and about 1,500 diesels will be purchased in this division in 1949, compared with approximately 1,200 in 1948. The gigantic petroleum industry, also a logical user of diesel engines, will step up its demand this year, too. Sales may reach close to 4,000 diesel engines this year, vs. 3,200 in 1948. Central and municipal plants will want a minimum of 300 diesel engines, another gain over the 1948 total, which approximated 280. Rural Electrification Administration demand will rise further; it is significant that at present over three-quarters of the total kilowatt capacity installed in R.E.A. cooperatives is produced by diesel engines.

Extra impetus will be given the diesel industry this year by the broad easing of the oil supply. Fast as the growth of the industry has been in recent years it was nevertheless somewhat hampered by the heavy demand for oil for other projects. Surplus inventories of oil now give the industry the green light on expansion.

The construction situation is extremely important from two standpoints—that of direct demand for diesel engines in its own right (about 30,000 engines for construction machinery should be sold in 1949, compared with about 25,000 in 1948), and that of its great underlying effect on the basic economy.

At present it does not appear that total new construction will reach last year's record-breaking aggregate, but such construction does not have to hit the $17,666,000,000 figure of last year in order to be considered a good showing.

Then, too, it must be realized again that the diesel engine industry is a young *growth* industry which can be expected to make a better showing than industry as a whole. For example, industrial diesel engines should attain sales of 14,000, despite some overall business setback, compared with about 12,000 in 1948.

For a realistic view of the underlying trends of the great, basic construction industry, it is necessary to differ with Government economists. Some of them have predicted a total new construction expenditure level this year 5.50% over the 1948 total, but unofficial checks I have made with several of them lately finds them dubious that this level can be reached.

There is, in fact, almost a feverish activity in some Government quarters to get public projects under way, stimulated by the beliefs of some that tendencies to recession would be thus thwarted. The majority, however, continue optimistic on the business outlook and many still talk apprehensively of inflation.

One reason for this apprehension is the tremendous amount of work, either approved or planned, and the competitive impact of such projects on the still-fairly-tight metals and related supplies situation. A minimum of $5,000,000,000 in Government, state and municipal projects (about a billion dollars higher than last year) is the level it is hoped to reach without disturbing the supply picture, which is thought further to be complicated by the rising defense and export-material spending.

It must not be forgotten that capital expenditures of states and municipalities also have been long-deferred; moreover, many of these have done financing for the various projects and have the cash in hand to proceed. Some of them, frankly, are awaiting lower building costs. That is one reason, the writer believes, that the longer term outlook will develop much more favorably than the majority of economists now anticipate.

There can be no question that the great shifts of population during the war years, together with the nation-wide wartime lag in construction, have created a need for expansion of public building that will be strongly felt for years to come. In addition to the obvious projects, spending on which could approximate $5,000,000,000 this year, there are hundreds of others that are less talked about, with the possibility that their crystallization would bring expenditures, the writer estimates, averaging about $7,500,000,000 for public building in the next several years.

Actually, from all I have been able to glean in my researches, public works needed now run well in excess of $100,000,000,000 prospective expenditures. One group in Washington has its eye on a figure even higher than this (about $120,000,000,000) as a long-term planning base in a potential drive to smash the peak-and-valley cycle and bring the nation at least some semblance of an even-progressing economy. Many projects have been postponed for years—through the big depression and the war—and meanwhile, the country's population has grown enormously, people have risen to a comparatively higher level of prosperity for more of the population; new urban centers and more geographical problems have been created.

Some economic pessimists have been pointing significantly at recent decreases in the rate of savings. This applies, however, only to the *rate* of savings. Even a considerable reduction in the total of the nation's savings would not be alarming, the writer believes, in view of the enormous total of savings.

In fact, since the liquid asset position of the nation now is bulging distortedly, it could logically be lowered (much of this money has been laid aside to the day when the desired things became more available) by $75,000,000,000, the writer estimates without cause for concern.

This bodes well for the general well being of the economy and for the well being of the diesel industry in particular because of its expected tendency to outpace the general economy.

The situation would be unreal, of course, if there weren't a cloud or two on the horizon. For example, it is felt by some railroads that the economic advantage of using diesel-electric locomotives would largely disappear if additional men were employed in the engine crew, as the unions demand. That, in turn, would curtail the railroads' program for the dieselization of their roads.

But the diesel's pre-eminence and desirability as the work horse of the engine field is simply incontestable. Wherever strength, dependability and low cost are considerations (and that covers a big cross section of American industry), diesel engines have a logical preference.

For example, in the case of the Burlington railway's experimentation, the diesel locomotive's freedom from major mechanical difficulties during the 401-day period of one-man operation of its Zephyrs was impressive. The trains ran 601,787 miles, made 1,752 trips, and completed 99.7% of these trips under their own power. On 96% of the trips they arrived at their terminals on time.

The Southern railway's Ernie Norris smiles happily when he talks of his magnificent fleet of diesel units (430 in service and 97 more on order). The large majority of the Southern's through freight trains and mainline passenger trains are powered by diesels. About 8% of motive power is represented by freight diesels, but they haul 50% of all traffic; passenger units cover 16% of motive power but account for 60% of passenger miles. Efficiency of the diesel engine is thus extremely clear.

On the basis, then, of this thorough establishment of the diesel engine in the American industrial and agricultural system, and of the impressive long term outlook, does the Board of Editors of Future Sales Ratings base its decision to give the diesel engine industry the top rating of five stars for the next 12 months. Obviously, this industry will generate tremendous buying power to carry out its numerous and diversified activities, which, considered in its various ramifications of markets, stamps the diesel engine industry as a billion dollar industry.

In this manner does the Board of Editors of Future Sales Ratings try to look ahead, after finding conclusively in many years of experience that 99% of most statistics in active use are stale. These stale, back statistics do not show us what we will do; they only show what we have done, and to use them in steering the course of the ship of business is like sending the navigator back to the stern to look at the wake. It is a pleasure, indeed, therefore, to have a majority authoritative foresight that the future looks good for diesel engines.

NEW DIESEL TUG "PATERSON"

By DWIGHT ROBISON

THE Erie Railroad added a 1000 hp. tugboat to its harbor fleet when the new diesel-electric *Paterson* was placed in harbor service March 1. She will be berthed in Jersey City. The new tug replaces a 500 hp. wooden vessel which was decommissioned in 1947 after more than 33 years of service.

The 101 ft. steel-hulled *Paterson* brings the number of Erie tugboats in New York Harbor service to 12. The railroad's "navy" consists of 248 ferries, tugs, lighters, barges, car floats, floating derricks, scows and other vessels used in loading and unloading ocean-going ships as well as intra-harbor activities. Thirty-eight additional pieces of marine equipment for the Erie Railroad are now in various stages of construction.

Designed by Tams, Inc., the new tugboat was built by the Jakobson Shipyard Corp. Design work was closely followed by M. B. Roderick, superintendent of the Erie's Marine Department. Consrtuction was inspected by the American Bureau of Shipping.

The *Paterson* will carry a crew of six men on each of the three watches every 24 hours. The galley and dining room are combined to conserve space. The main part of the room is occupied by a round table surrounded by six stools. A sink, electric stove and electric drinking water cooler have been installed along one wall of the room. Immediately after the dining room is the crew's locker and shower room. A doorway connects the two areas, making it unnecessary for the crew to go out on deck during inclement weather in moving between the two rooms.

A heating plant, burning diesel fuel, provides ample steam for warming the interior of the tug. This assures comfortable working conditions for the crew during the most severe weather. With the engine room occupying the central portion of the boat's superstructure, a cabin is located in the aft end. The engine room is equipped with a ventilating system for increased worker comfort. The propulsion machinery consists of a complete General Motors marine diesel-electric system. The main engine is a 12-cyl. Model 278-A two-cycle diesel. It is installed at the forward end of the engine room and is directly connected to an 814-kilowatt direct current generator. The generator supplies direct current to the 1000 hp. propulsion motor turning 700-785 revolutions per minute. A Farrell-Birmingham reduction gear brings actual propellor shaft speed from 120-150 revolutions per minute.

Diesel tug Paterson, driven by a 1200 hp. General Motors engine.

One of the notable features of this system is that the full horsepower of the motor is delivered to the shaft at any speed between 120 to 150 revolutions per minute. As a result, there is no loss of power when propellor revolutions are slowed down because of heavy load or slow speed through the water. The main generator and motor are separately excited by a 24 kilowatt generator attached to the main generator shaft.

The engine room is completely equipped with all necessary pumps, air compressors and other items to meet inspection requirements and assure a thoroughly modern plant.

Two 30-kilowatt GMC Series 3-71 diesel generator sets supply current for ship service through a general distribution switchboard in the engine room. This switchboard is separate from the main propulsion current control panel.

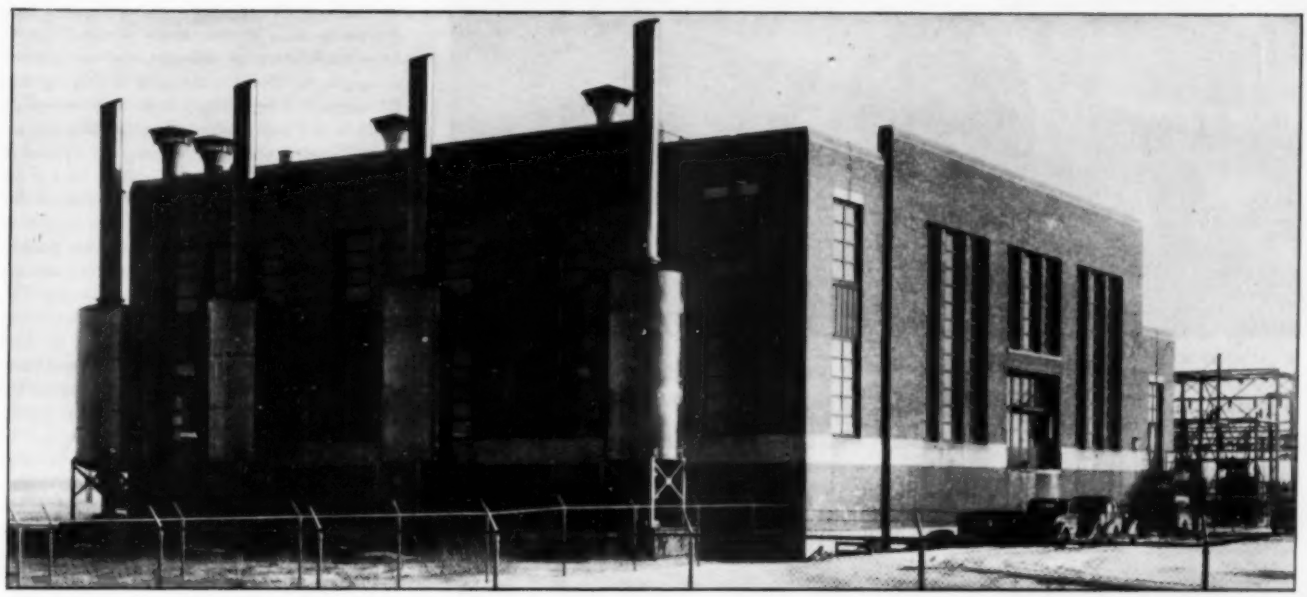
Another important feature is the arrangement whereby the *Paterson* may become an emergency fireboat. The installation was made on the principal that a limited fire fighter on the scene of an emergency is much more effective than larger apparatus some miles away. A fire monitor is mounted on the roof of the pilot house. It is supplied with water delivered by a Goulds centrifugal pump driven by a direct connected 40 hp. motor. The pump has a capacity of 476 gal. of water per minute. This centrifugal pump has an independent sea connection.

Hose connections have also been installed on the sides of the deck house and these are supplied with water by a Carter centrifugal bilge pump at the rate of 250 gal. per minute. Fuel and water tanks are constructed separate from the hull to avoid leaks in case of damage to the shell plates. The total fuel capacity is 13,000 gal.

In addition to the *Paterson*, the Erie Railroad operates 11 other tugboats in its fleet. Seven tugs are steam powered and, with the *Paterson*, there are five diesel craft. Other vessels in the fleet of 248 are five ferry boats, one steam-powered lighter, three diesel-propelled lighters, 27 car floats, two steam-powered floating cranes, 15 gasoline-powered floating cranes, 68 scows, 97 barges, and 20 refrigerated barges.

MARSHALLTOWN, IOWA

By GLENN C. BOYER



Exterior view of the Marshalltown plant of the Iowa Electric Light & Power Company. Exhaust snubbers are Burgess, the two on the left for the new 7100hp. Nordberg diesel.

"YES sir, that diesel power plant out east of town is a big one! I understand the new engine burns 22 gal. of fuel a minute!"

The full significance of this remark, made by a Marshalltown, Iowa, resident as we sped westward out of Chicago on the "City of Denver," didn't register with me until I stepped through the front door of "that diesel plant" the following morning. Many years of contact with diesel engines large and small, single-acting and double-acting, had insulated me against the supposedly startling new development in the field. But an inspection of the diesel plant owned and operated by the Iowa Electric Light and Power Company at Marshalltown, Iowa, disclosed a number of innovations and engineering developments that make it an outstanding plant in the diesel field.

The power-plant building is of modern functional design. It has a full basement of reinforced concrete. The superstructure has a structural-steel framework and brick walls. All engine auxiliaries are located either in the basement or at the engine end of the plant on the operating-floor level or the second floor of the auxiliary bay. Switchgear and controls are located at the generator end of the plant, as is the plant operating office. A well-equipped shop is maintained at the engine-end of the plant on the operating-floor level. The main engine room is 93 ft. 8 in. long and 72 ft. wide with a height of 28 ft. A traveling crane of 20-ton capacity serves the engine room.

Of prime interest is the 7,100-bhp Nordberg diesel engine delivering 5,000 kw. to the switchboard at full load. This 10-cylinder engine with a 29-in. bore and 40-in. stroke is a single-acting, two-stroke-cycle unit. It is reported to develop the greatest horsepower per cylinder of any single-acting, two-stroke design in the world.

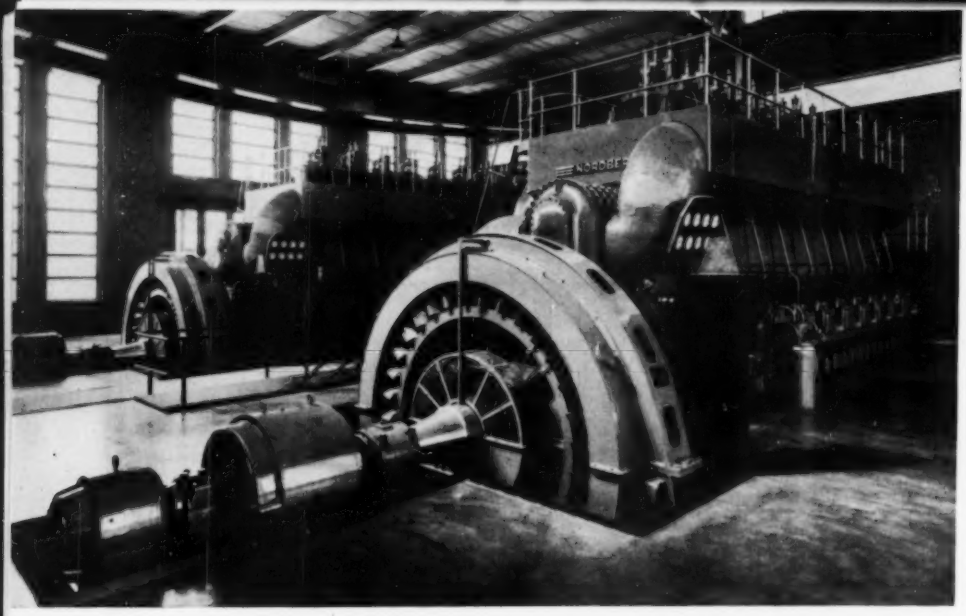
This plant, with an installed capacity of 10,000 kw. in three units, is located approximately in the middle of the Iowa Electric Light and Power Company property. Most of the power for this system is supplied by two steam plants, one located at Cedar Rapids at the approximate east end of the system, the other located at Boone on the west end of the system. A transmission line, operating at 115 kv., connects these steam plants and forms the backbone of the transmission network of the company. The Marshalltown diesel plant feeds directly into this transmission network.

Marshalltown is one of those thriving Iowa communities with a population of approximately 27,000, combining both agricultural trade and manufacturing. The Lennox Furnace Company, building heating and air-conditioning equipment, and the Fisher Governor Company, noted for its automatic pressure-regulating valves and other control specialties, are but two of many industrial establishments in the community ranging from hatching baby chicks to making steel castings.

Because of its importance as an industrial center, and because it is located approximately in the center of the territory served by the Iowa Electric Light and Power Company, it was considered advantageous by that utility to establish a power-generating station at Marshalltown. Studies indicated that the plant should be capable of supplying Marshalltown in the event of transmission-line failure, assist in maintaining voltage on the 115 kv. transmission system, and be available for other emergency and peak-load service as the system might require. As a consequence, the decision was made to construct a diesel generating plant since it combined the features most desirable for the type of plant to be installed. Marshalltown, furthermore, has direct rail connection over the Chicago Great Western with Kansas City and the oil-producing area of Kansas, Oklahoma, and Texas and fuel oil could be secured by direct rail connection as needed.

Work on the project started in 1941. The first two generating units, each of 2,500 kw. driven by a Nordberg 3,600-bhp air-injection engine, went into operation in December, 1942. The third unit of 7,100 bhp was put into operation in December, 1947. The station is used for peak-load and stand-by service only, permitting the utility to operate its steam turbo-generators at more economical loads and thereby save on steam-plant-fuel costs.

The "Big Bertha" of the plant, producing 7,100 bhp, is an impressive engine—impressive because of its relative simplicity. An American-Bosch fuel-injection pump is located adjacent to the cylinder head of each cylinder, and as a result the fuel line between fuel pump and injector is very short. Fuel nozzles are water cooled by the jacket-water system. Each cylinder is provided with force-feed lubrica-



Two, nine-cylinder 3600hp., Nordberg diesels originally installed at Marshalltown.

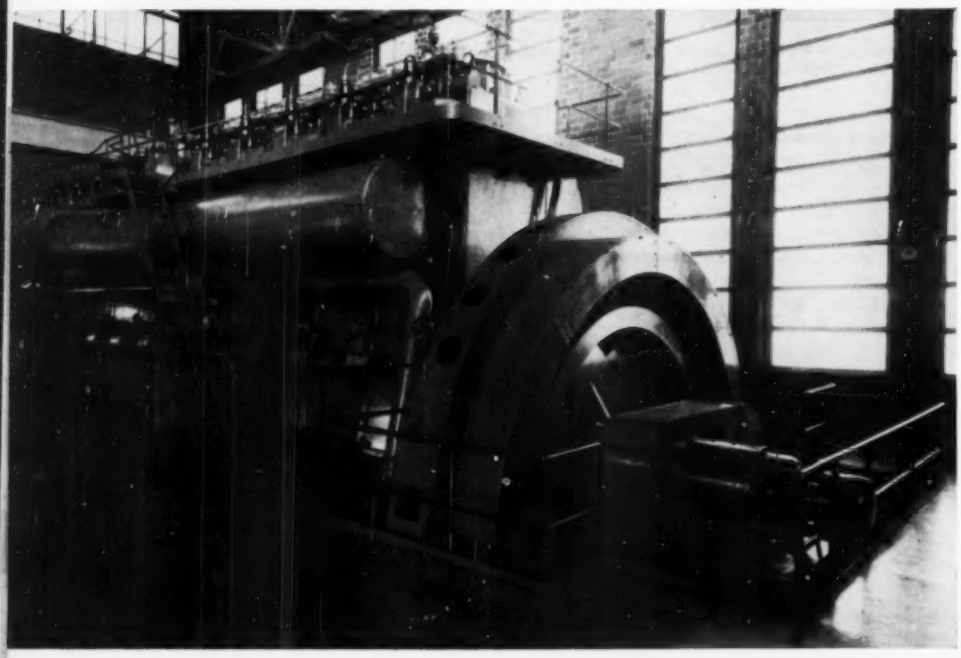
tion at seven points and each seven-point Manzel lubricator is located where it can be inspected from the operating floor.

Scavenging air is furnished by a 3,560-rpm Elliott centrifugal blower of 44,000-cfm capacity boosting the air pressure 2.7 psi driven by a 600-hp induction motor. Bearings in this high-speed blower are pressure lubricated. A motor-driven lubricating-oil pump operated by electric pressure-control switches on the bearings, is used for supplying lubricating oil pressure when starting and stopping the unit and for emergency operation. The incoming air is filtered by two Dollinger "Staynew" Type HD filters, each having an air capacity of 35,000 cfm. No muffling is provided in the in-take system.

In line with its engineering policy to make each generating unit, whether steam or diesel, an independently-operating assembly, the motor-driven scavenging-air blower is arranged to start up with the engine. The 600-hp motor is connected directly to the generator terminals. When the engine is started up, electrical relaying equipment connects the 125-volt station battery to the exciter field. With excitation on the field of the generator as the engine is turned over by 350-psi compressed air, the a-c voltage builds up quickly, and the scavenging blower is operating as soon as the engine starts to fire. As the normal 250-volt field of the exciter builds up, the station battery is automatically disconnected from it. This system for starting the scavenging-air-blower motor was developed in this station and has worked very successfully.

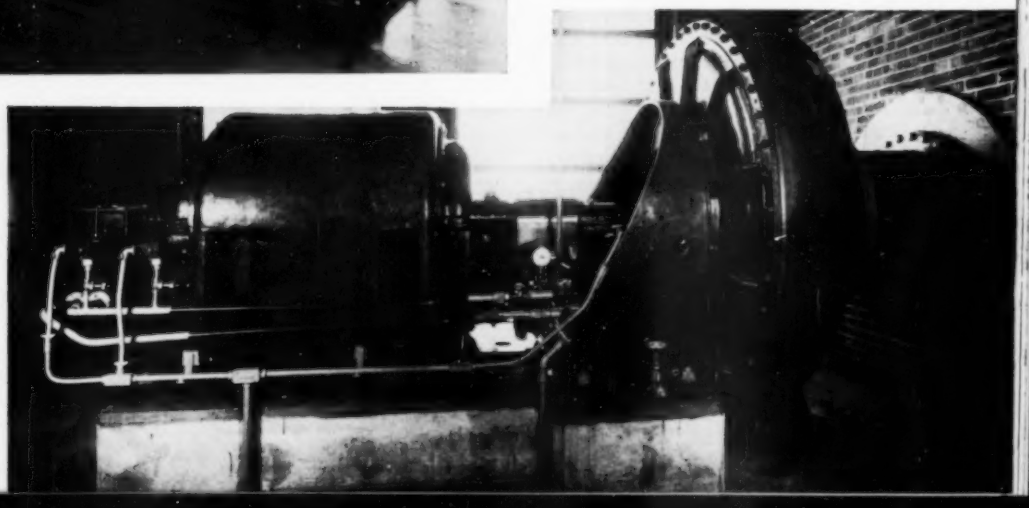
A butterfly control valve, located in the scavenging-air header between the blower and the engine, regulates the pressure of the air supplied to the engine. A mercury pressure gage, connected to the air-intake manifold, serves as a guide for the operator when manually adjusting the position of the butterfly valve to maintain an operating manifold pressure between 2.35 and 2.50 psi gage. This manual control of the scavenging-air pressure ensures sufficient air pressure at all times while reducing the required horsepower output of the scavenging-air-blower motor to a minimum. The engine is equipped with two exhaust headers. A Burgess-Manning snubber is installed on each of the exhaust lines outside of the building.

The cooling system is of the closed or double-circuit type. Two Schutte & Koerting shell-and-tube heat exchangers are used for cooling the jacket water and two are used for cooling the lubricating oil. An expansion tank of the jacket-water system compensates for volume of the jacket water eliminates the possibility of corrosion. A jacket-water pump of 1,800-gpm capacity at 100 ft head and a raw-water pump of the same capacity and head are normally used for this engine, although



↑ The new, ten-cylinder, 7100hp. Nordberg diesel and 5,450kw. General Electric generator, bringing the total capacity of the Marshalltown plant to 10,000kw.

→ Elliott 600 hp. motor and 34,000 cfm. scavenging blower, discharging at 17 psi to the intake of the 7100 hp. Nordberg engine.



other raw-water pumps in the station can be used in an emergency.

The pressure-lubrication system for main bearings, piston cooling, and other pressure-lubricated parts other than cylinders, consists of a lubricating-oil pump belt driven from the engine end of the unit, a lubricating-oil sump tank located in the basement, an Elliott twin strainer, and two Schutte & Koerting shell-and-tube lubricating-oil coolers. An emergency lubricating-oil pump driven by a 60-hp motor is provided for use when starting and stopping the engine as well as for service in event of failure of the belt-driven pump.

Purification of the lubricating oil is accomplished by bypassing lubricating oil from the sump tank through either or both of two Honan-Crane continuous oil purifiers. The oil is pumped out of the sump tank, through the filters, and returned to the sump.

Plant controls have been centralized to facilitate the normal operating routine. Electrical output control is centered at the main switchboard, while all engine controls are located on an auxiliary instrument panel adjacent to the engine starting station. This engine control panel for the 7,100-bhp unit contains the following metering facilities and electrical controls: Pyrometer for cylinder exhausts; Ammeter for reading amperes delivered to scavenging-blower motor; Pressure gages for lubricating oil before and after cooler, fuel oil before and after filters, starting air, scavenging air, and raw and packet water; Starting and stop push buttons with indicating lights for turning gear, two lubricating-oil-filter pumps, two raw-water pumps, jacket-water pump, auxiliary lubricating-oil pump, and scavenging-blower-lubricating-oil pump.

The fuel-consumption guarantees under which the 7,100-bhp unit was purchased are as follows:

Percent rated load	100	75	50
Pounds fuel per bhp-hr	0.38	0.38	0.41
Pounds fuel per kwhr at 80% power factor	0.534	0.535	0.582

These guarantees were based upon a fuel oil having a heating value of 19,350 Btu per lb. The specifications of the engine builder for suitable fuel set the following limiting conditions.

Viscosity (SSU @ 100 F)	500
Conradson carbon, max.	5%
Water and sediment, max.	1%
Sulfur, max.	2%
Ash, max.	0.1%
Flash point	150–250 F

At the present time, light and heavy fuels are being blended to secure characteristics required by the engine and suitable for handling under the climatic conditions experienced at Marshalltown. Characteristics of the present fuel are as follows:

Specific gravity	0.9346
Viscosity (SSU @ 100 F)	461
(SSU @ 210 F)	46
Heating value (Btu per lb)	19,042

A spur track at the plant site, connecting with the Chicago Great Western Railroad, is equipped with tanker unloading facilities including steam-heating supply lines, should it be necessary to unload heavy fuel during severe winter weather. The incoming heavy oil is stored in two 500,000-gal and 100,000-gal tanks. Each tank is equipped with a fuel-oil heater located at the tank outlet.

The heavy fuel is processed for use in the engines by centrifuging. After centrifuging, it is stored in a 50,000-gal tank where it is kept warm to maintain a desired viscosity at all times. The 7,100-bhp engine is equipped with two fuel-oil filters, and all centrifuged fuel first passes through a Honan-Crane adsorbent-type filter followed by filtering through a Nugent duplex cellulose filtering element. Light fuel oil is used for starting and stopping the engines. It is stored in a 100,000-gal tank. In addition, a kerosene storage of 20,000 gal is provided.

Severe climatic conditions encountered during the winter and intermittent operation of the station for peak-load and standby service while using highly viscous fuel oil has necessitated a rather unusual fuel-heating system being employed. The two smaller engines in the plant are equipped with Combustion Engineering Company, standard marine waste-heat boilers. Water-jacketed exhaust manifolds on the 7,100-bhp engine also provides hot water. The hot water from the waste-heat boilers or the water-jacketed exhaust lines is passed through a Griscom-Russel finned tube heat exchanger. Here kerosene is warmed and then circulated through heaters installed in the yard fuel-storage tanks. Kerosene was selected as the heat-conveying media from the plant to the yard tanks because it could be left in the pipes during cold weather without freezing should the plant be shut down for any appreciable time.

A small-capacity oil-fired steam generator in the plant ensures building and fuel-oil heating should the plant be shut down for prolonged periods during severe winter weather. It is seldom called upon for service, however, because the waste-heat recovery system now in use with the three engines in the station provides sufficient heat under the existing operating schedule.

The generator for the newest unit is rated 6,813 kva, or 5,450 kw at 80 per cent power factor,, three-phase, 60-cycle, when operating at 164 rpm, and is arranged to generate at 4,160 volts. Excitation is provided by a belt-driven exciter of 50 kw capacity at 250 volts and running at 850 rpm. A 3 kw, 250-volt pilot exciter is connected directly to the shaft of the main exciter and operates at the same rotative speed. The main and pilot exciter assembly is driven by V belts. This exciter combination produces more rapid excitation for the generator than would be possible without the pilot exciter. The stator and rotor assemblies are both of welded construction. Necessary flywheel effect is provided by the welded rotor. Generator and exciters were built by the General Electric Company.

Voltage regulation for the 5,450-kw unit is provided by a General Electric Model 3GFA voltage regulator. The two 2,500-kw units do not require voltage regulators because the transmission system normally regulates their voltage. In the case of the larger machine, however, it was necessary to provide automatic voltage regulation.

The two 2,500-kw units generate at 2,400 volts and both are connected to a common 2,400-volt bus. Transformers connect from the 2,400-volt bus to a 34.5-kv bus in the switch station yard. The 5,450-kw unit connects directly through a step-up transformer bank to the 34.5-kv bus. High-voltage transformers and switching facilities in the substation connect the 34.5-kv bus to the 115-kv transmission system.

The cooling water pump bay in thte basement shows careful piping layout.

Waste heat boiler on the exhaust of one of the 3600 hp. engines.

COLUMBIA QUARRY

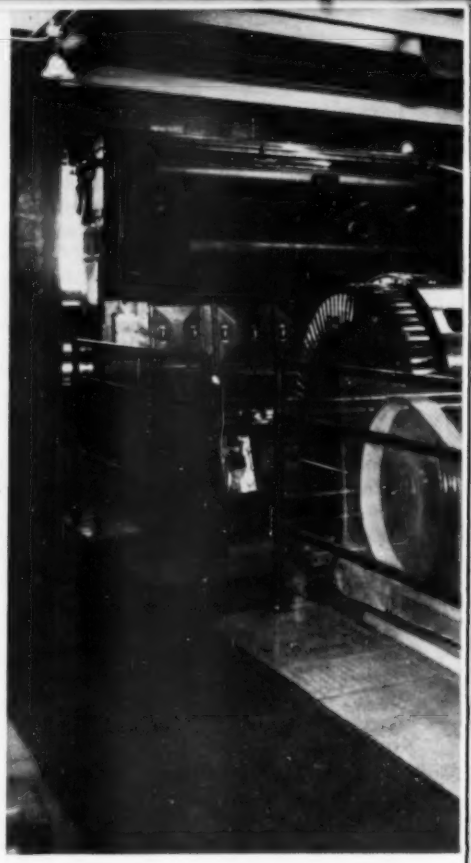
Seven Superior Diesels Provide Power To Process 9,600 Tons Of Limestone Per Day At Two Major Quarries In Southern Illinois

By WM. H. GOTTLIEB

IN less than 12 years, Columbia Quarry Co., one of the nation's largest producers of agricultural limestone and kindred stone products, has used Superior diesel engines to produce more than 42,000,000 kilowatt hours to power its quarrying and processing operations. It is estimated that the diesels provided the company a net saving of more than $150,000 as compared with the previous cost of purchased power.

In its long operating experience, the company has tried several alternate sources of power. Quarry No. 1 at Krause, Illinois, started up in 1906 with a steam plant, then switched to purchased power in 1920, and finally to diesels in 1936. Quarry No. 3 at Valmeyer, Illinois, used steam initially when it began operations in 1918, turned to purchased power in 1926, and then to diesels in 1937. Now, these two major plants provide an excellent opportunity to see the efficiency and economy of diesels in the stone processing industry.

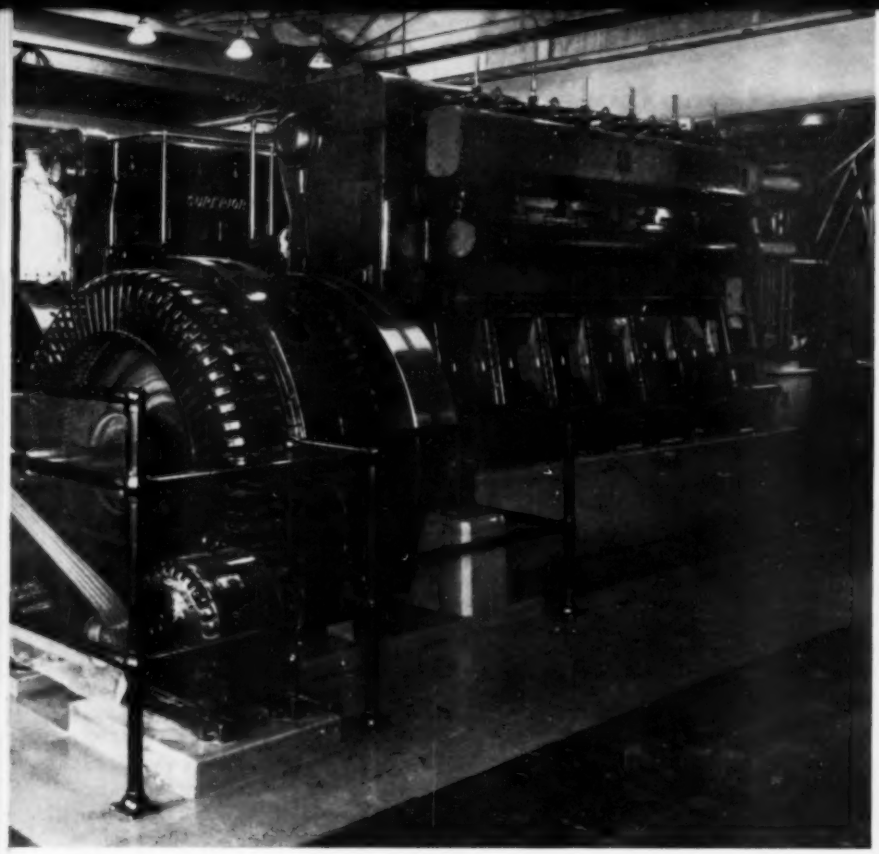
A disastrous fire which virtually destroyed the processing plant at Krause in July 1947 elicited from company officials a striking testimonial of their faith in diesel engines. The power plant, several hundred feet from the other buildings, escaped all damage, but in the main building, most of the equipment was ruined and only one of scores of electric motors was deemed salvagable. All motors and generators at Krause operated on 25 cycle current, unobtainable from private utilities. Thus, if the company replaced the damaged motors with more 25 cycle equipment, the plant would be inextricably wedded to diesels. Before ordering the motors the company made an exhaustive study of diesel operating costs, comparing them with the cost of alternate power sources. The decision was to continue with 25 cycle current and diesel engines.



This stone processing plant at Krause, Ill., was completely rebuilt after a disasterous fire in July 1947. All power for its 6,000-ton per day production is supplied by four Superior diesel engines.

Here are some of the figures that influenced that decision: At the Krause plant, the diesels produced 25,777,300 kw. hours, from 1936 through 1947 at an average cost of $0.00943 per kw. hr. The last year that power was purchased, the rate was $0.015 per kw. hr. If we use these two costs as a basis for comparison, the company saved $0.00557 per kw. hr. through the use of diesels, or a total of $143,579.56. At Valmeyer, diesels generated 16,941,100 kw. hrs. at an average cost of $0.01013 and again the late rate on purchased power was $0.015. This meant a saving of $0.00487 per kw. hr. or a total of $82,503.16. For the two plants the combined saving amounted to $226,082.72. The diesel costs cited include all items of expense except depreciation. Allowing a liberal $70,000 for depreciation, we arrive at a net saving of $156,082.72.

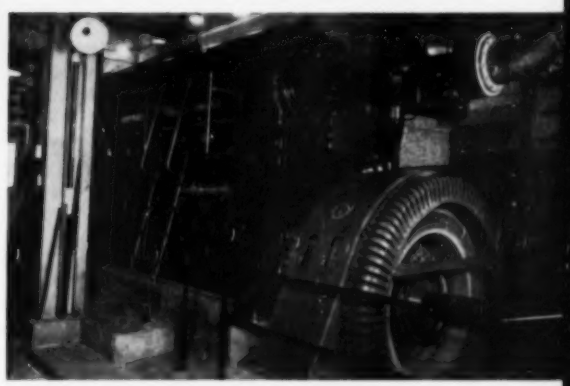
To produce this large volume of power at low



This view of the engine room at Quarry No. 1, Krause, Ill., shows three of the four Superior diesels that generated more than 25,000,000 kw. hr. in 12 years.

Largest of the engines in the Krause plant is this 8-cylinder, 14½ x 20-in., supercharged Superior rated at 1000 hp. at 300 r.p.m.

Lubricating oil for the newest engine at Krause is cleaned continuously in the Briggs clarifier at right and cooled in the Ross oil cooler, left. Also shown in the picture is the Alnor exhaust pyrometer.



Newest engine installed by Columbia Quarry at Valmeyer is a 6-cylinder, 14½ x 20 in. Superior rated at 1080 hp. at 360 r.p.m. This Elliott-Buchi turbocharged diesel was installed in 1948 and drives an Ideal Electric generator.

cost, Columbia Quarry developed two efficient multi-engined diesel plants. At Krause, there are four engines totalling 2,7050 hp. now in operation. The Company's first diesels, installed in 1936, are a 6-cylinder, 12½ x 15 in. Type LO Superior rated 400 hp. at 375 r.p.m. and an 8-cylinder engine of the same type and bore and stroke with a rating of 525 hp. The third engine, put into service in 1944, is an 8-cylinder, 14½ x 20 in. Type VOSS Superior, equipped with an Elliott-Buchi turbocharger and developing 1,000 hp. at 300 r.p.m. Newest engine in the plant, installed in 1946, is a 6-cylinder, 14½ x 20 in. Type VDSS Superior, with Elliott-Buchi turbocharger, delivering 825 hp. at 300 r.p.m. All these units are direct-connected to Allis-Chalmers alternators which generate 3 phase, 25 cycle, 480 volt current.

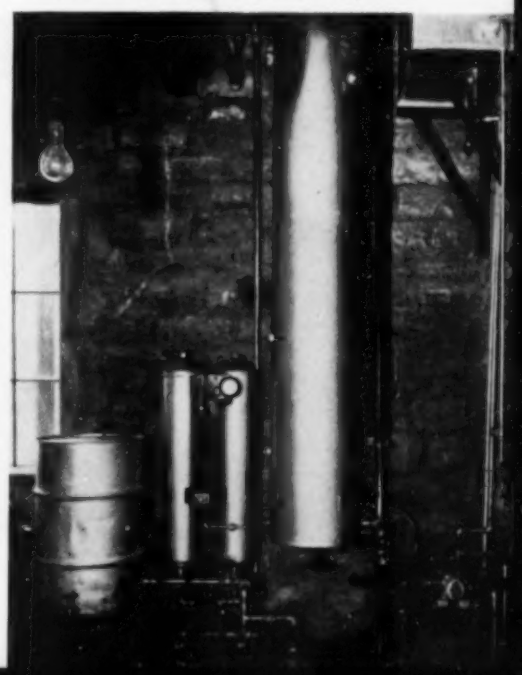
At Valmeyer, there are three diesels with a combined rating of 2,000 hp. in service. A 6-cylinder, 12½ x 15. Type LO Superior, installed in 1938, it rated 420 hp. at 400 r.p.m., while a 6-cylinder, 12 x 15 in. Type KNB Superior, installed in 1941, provides 500 hp. at 500 r.p.m. Newest engine in either plant is a 6-cylinder, 14½ x 20 in. Type VDSS. Elliott-Buchi turbocharged Superior diesel. All the engines at Valmeyer drive 3 phase, 60 cycle, 480 volt alternators, Ideal Electric for the new engine, Allis-Chalmers for the others.

In recent years, with inflationary pressures affecting the price of fuel, economy in fuel consumption has become increasingly important and the greater efficiency of the new supercharged engines has offset much of the rise in costs. According to the Columbia Quarry Co., the old engines produce a good 11.5 to 12 kw. hr. per gal. of fuel consumed, while the supercharged diesels return a phenomenal average of 13.5 to 14 kw. hr. per gal. of fuel.

Both of these large quarries operate a minimum of 16 hours a day, six days a week, 52 weeks a year, and in both plants the peak loads are close to rated diesel capacity. At Krause, it takes as much as 2,000 kw. to run the massive equipment required to maintain the desired production rate of 6000 tons per day according to Superintendent E. A. Heise. Stone processing is a difficult and uneconomical load whatever the source of power, for motors are large, peak demand high, and the load fluctuating. In this case, electric power is used in almost every phase of the work. Two motor-driven Bucyrus Erie well drills and one gasoline-driven Loomis are used to drill 8-in. holes for dynamite in the 70-ft. quarry face. A 2 cu. yd. Bucyrus Erie electric shovel is used in conjunction with a Marion diesel shovel to strip over-burden and cap rock. The electric shovel and a well drill can be carried by a single diesel but it is a tough load to handle.

Primary crusher is a 21N Allis-Chalmers gyratory

Fuel at Quarry No. 1 is transferred from storage by a Roper rotary pump through a Duplex Briggs clarifier into a vertical cylindrical supply tank. Additional pumps transfer the fuel to individual elevated day tanks.



unit driven by a 250-hp. motor, and secondary crushing is accomplished by two 10-in. and one 6-in. Superior-McCulleys, a 4-ft. Symonds cone, and a 636 Type R Allis-Chalmers. The first four secondary crushers have 100-hp. motors, the fifth a 75-hp. unit. There are 14 screens in the plant: two 4 x 8-ft. double-deck Stephens-Adamsons, one 4 x 10-ft. double-deck Allis-Chalmers Ripl-Flo, two 4 x 14-ft. triple-deck Ripl-Flo, two 5 x 14-ft. double-deck Allis-Chalmers low-heads, four 5 x 14-ft. Ripl-Flo, two x 12-ft. Ripl-Flo, and one 4 x 14-ft. triple-deck Tyler Ty-Rock. A flexible arrangement of conveyor belts, gates and spouts permit blending of any of the 15 standard sizes in any of the 10 finished product bins and the plant offers as many as 40 different grades of stone.

Major equipment in the pulverizing section includes American ACS3 hammermills each driven by a 250-hp. motor, three 36 x 60-in. Syntron pan feeders, a 5 x 14-ft. double-deck Ty-Rock screen, and a 4 x 14-ft. single-deck Ty-Rock. Of total plant production, about half takes the form of agricultural limestone while, the rest is divided among road stone, concrete stone and railroad ballast.

The Valmeyer quarry has a daily production of 3,600 tons of a high calcium stone (99.6 percent calcium and magnesium carbonates of which less than 2 percent is magnesium carbonate) for use as fluxing stone in foundries, for lime used in aluminum refining, for feed mixes, roofing filler, asphalt road material filler, and many other uses. To achieve this production, the plant requires an average of 1100 kw. with peaks up to 1300 kw. Prior to the installation of the 1080-hp. diesel, some purchased power was needed to augment the home-generated supply. This contract with the private utility expires in July 1949 and after that the diesels will handle the entire load.

The success achieved in providing power for the large-scale stone production at Krause and Valmeyer can be attributed to the choice of efficient, heavy-duty diesel engines and good accessory equipment, and to sound, methodical operation and maintenance.

All the engines are four-cycle, mechanical-injection diesels and all are operated on Standard industrial diesel fuel. At each quarry, fuel is stored in a 15,000-gal. tank outside the plant. At Krause, the fuel drawn from storage is put through a duplex Briggs clarifier into an overhead day tank within the engine room by an automatically-controlled, motor-driven Roper rotary pump, then through duplex Purolator filters to the engines. At Valmeyer, the two authomatic motor-driven and one continuous engine-driven Viking pumps keep individual elevated day tanks full. Again there is a Purolator filter for each engine. In the newer engines, fuel is fed from a 15 to 20 p.s.i. header to an individual cam-activated injection pump above each cylinder head. The quantity of fuel injected is regulated by Woodward governors.

All the diesels have full pressure lubrication systems and Standard Nonpareil heavy diesel oil is used throughout both plants. There is a lube cooler, either a Ross or a Graham, for each engine. A variety of means are employed to keep lubricating oil clean: a Briggs clarifier, Hilco purifier, Hilco Hyflow filter, Honan-Crane purifier, and several Purolator filters. Superintendent Fred A. Krewer of the Valmeyer quarry reports that lubrication economy is good, bearing and cylinder wear small, and a stuck ring a rarity. The same description is applicable to the Krause plant operation.

The pattern of engine protection continues in the cooling water system with only soft water permitted to enter the engine jackets. At Krause, creek water is put through a softener for addition to the soft water system when required. Motor-driven Deming centrifugal pumps circulate the water through the engines and through piping in three atmospheric cooling towers. A pair of motor-driven Weinman centrifugals pump untreated water over the towers. At Valmeyer, city water is treated in a softener. Motor-driven Weinman contrifugals circulate the soft water through the engine jackets and Sims heat exchangers while similar pumps put raw water through the exchangers and over an atmospheric cooling tower. Water from the raw circuit is used to wash stone.

Intake air is filtered for all units with Air Maze oil bath filters for the latest installations. In the case of these supercharged engines, the filtered air is forced into the intake manifold by a centrifugal blower and reaches the cylinders under pressure through the standard dual inlet valves.

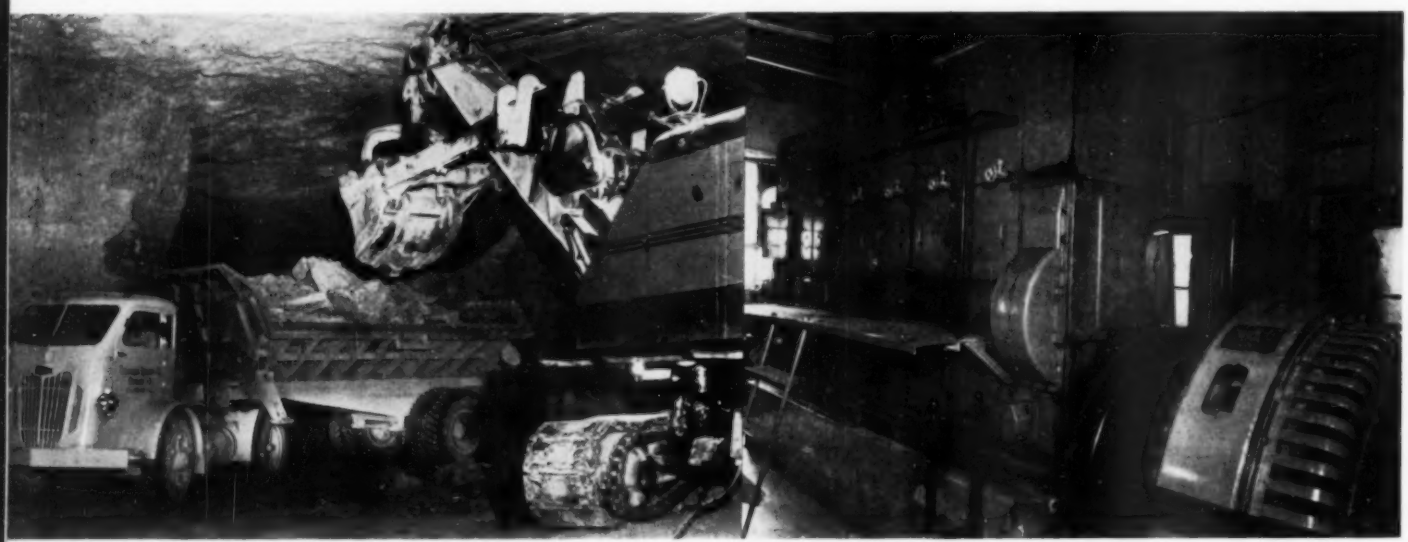
There is a well-equipped Allis-Chalmers switchboard in each plant with an Allis-Chalmers rocking-contact voltage regulator for each engine. Both plants have conduit circuit breakers and Westinghouse totalizing kw. hr. meters. Alarm panels hold pressure gauges on lube, fuel and starting air with alarms on engine lube pressure, turbocharger lube pressure, water temperature, and overspeed. An Alnor multi-point exhaust pyrometer connects with thermocouples at each cylinder of the diesels.

Columbia Quarry is unusually well equipped to handle maintenance. At Krause, a large machine shop employing eleven men does all necessary repair work on stone processing equipment of all the company's quarries and it is a simple matter for these trained men to care for the power equipment as well. As a general rule, pistons are pulled for inspection and servicing once a year. With adequate manpower, there is a minimum loss of working time.

With the new turbocharged Superior diesels, Columbia Quarry's power plants are more efficient today than ever before in their twelve years of service and seem certain to justify President H. C. Krause's decision to place his dependence in diesel engines.

At Valmeyer, the stone is mined and an electric shovel with special short boom and stick loads stone under ground into tractor-drawn side-dump semi-trailers.

Installed at Valmeyer in 1941, this 6-cylinder, 12 x 15-in. Superior rated at 500 hp. at 500 r.p.m. played a large part in the plant's total production of 16,941,100 kw. hr.



DIESEL TUG "TURECAMO GIRLS"

By ALFRED A. DECICCO

TURECAMO GIRLS, in operation since 1933, has unmistakably set a remarkable place for herself in the New York harbor and vicinity. Designed by Merritt Damarest and built by the Bath Iron Works in Maine, she has an overall length of 93 feet, is 23 feet in width, and has an 11½ foot draft at the stern. *Turecamo Girls* is capable of doing 11½ knots and can make a complete crash stop in 28 seconds flat. Talking with the skipper, Captain Davis, he states that the tug is in operation twenty-two out of the twenty-four hours in the day.

Turecamo Girls is a large boat; she has quarters for a crew of nine, and these quarters with their more than adequate ventilation, lighting and all around attractiveness would grace any millionaire's yacht you ever saw. The interior is entirely paneled with mahogany and chrome stripping. From bow to stern, she is kept immaculately clean—a must of every tug in the fleet owned by the B. Turecamo Towing Corporation. Thirteen men are maintained for the crew of the tug with nine men in operation twenty-four hours a day. The shifts are two weeks aboard, one week off. An interesting comfort to the working crew is that the entire tug is internally passaged. No outside transit is necessary which is an assuring comfort during foul weather.

The *Turecamo Girls* is wheel house controlled with an electric stearing gear by Sperry. Being able to go from one assignment to another without coming back to home dock, is made possible by a ship-to-ship and ship-to-shore R.C.A. radio telephone. The direction finder is also an R.C.A. product.

Towing power is a tugboat's reason for being on the waterways, and *Turecamo Girls* has not been neglected in this regard. The power plant is a General Motors diesel, V-type, with 16 cylinders, 8¾ inch bore with a stroke of 10½ inches. Horsepower is rated at 1440 at 750 rpm. This engine is fitted with a Falk Airflex reversing-reduction unit with a 3.7 to 1 ratio.

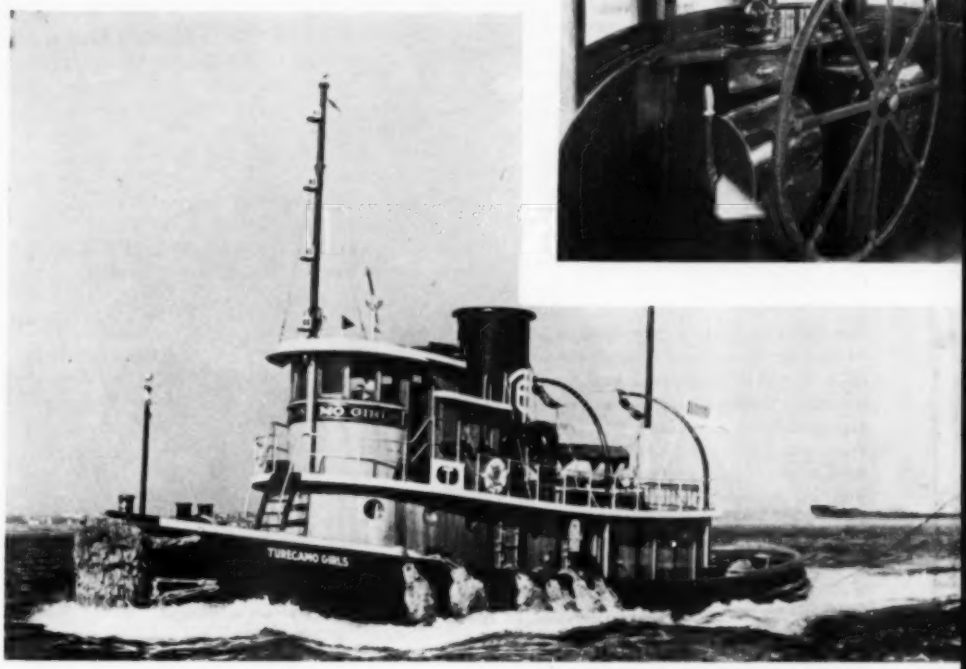
Cooling is closed circuit, using a Ross heat exchanger, another Ross exchanger cools the lube oil. Governor is Marquette, pyrometer is Bristol. Lube oil filter and reclaimer is a Briggs Clarifier, cartridge type. Air compressor for engine starting is a Gardner-Denver driven by a Star electric motor. The lube oil pump is a Viking.

Turecamo Girls carries one diesel auxiliary unit which is a 20 kw. Star generator, a Viking pump, and a Gardner-Denver air compressor, all driven by a Hercules diesel engine rated at 30 hp. at 1200 rpm. This auxiliary diesel unit is electric starting using Titan batteries. Entire unit was installed by the John Reiner Co.

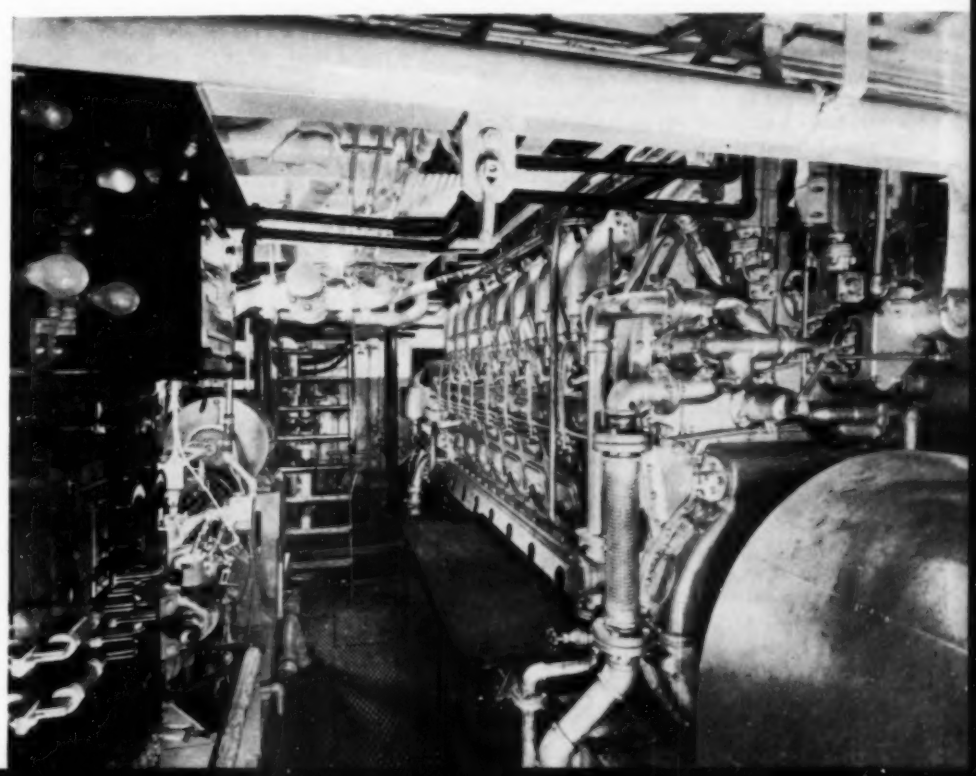
Jakobson Shipyard, Inc., Oyster Bay, New York, did the job of installing all the new machinery in this ship.

Wheel house showing Sperry electric steering gear and Weston tachometers. →

↓ Diesel tug *Turecamo Girls* powered by 1440 hp. General Motors engine.



General Motors 1440 hp. diesel engine driving through a Falk Airflex reversing reduction gear. At left, is a John Reiner Co. auxiliary unit.



THE P & H DIESEL

By WILBUR W. YOUNG

VERY quietly, for several years a new diesel engine has been in the making up in Port Washington, Wisconsin. There, the new engine and the Diesel Division of Harnischfeger Corporation have at last taken shape and I went up there late in February to see the results—a line of 2-cycle, blower-scavenged diesels of low horsepower-weight ratio, designed with definite objectives in view, being produced in a finely tooled and amply staffed pilot plant.

Well isolated from the parent plant at Milwaukee, Karl P. Schoeppner began, years ago, to develop a diesel engine—"for the toughest job known"—that is, for excavator application. That was natural because Harnischfeger is widely known as a builder of heavy machinery, so an engine suitable for the toughest service in its own products could conceivably be good for many markets. You may be sure Mr. Schoeppner tried all the tricks and for a long time he played a lone hand, but we are mostly concerned with the end result—an engine that has lived through the design and development stages, has given account of itself in the field and is now in production on a pilot scale, with an organization of experienced diesel men backing it up.

So here it is. A 2-cycle basic cylinder of 4½ in. bore and 5½ in. stroke with piston displacement of 87.472 cu. in. Now being assembled in two models, 3-, and 6-cylinders, the engines embody maximum interchangeability of parts. Aside from the blocks, valve covers, oil pan, crankshafts and camshafts, virtually all other parts are common to both the 3, and 6-cylinder models.

The heart of the P&H diesel appears to be the patented cylinder head and liner assembly, which was developed by the Harnischfeger Diesel Engine Division. Each cylinder is an independent, fully water jacketed assembly, comprised of liner, copper plated water jacket and cylinder head with valve in place. This complete assembly, including piston and rod, minus the rod cap, may be removed in three quick steps: (1) disconnect fuel line and remove injectors; (2) remove connecting rod cap through inspection port in lower crankcase, (not necessary to drop the pan): (3) remove four head nuts and lift out cylinder head, liner, piston and rod as a complete unit. Installation of this assembly is made by reversing the above steps. The liner itself is machined from seamless alloy steel tubing and heat treated and the ports are given an interesting angle which is obviously intended to create optimum turbulence. Simplicity seems to have dominated this designer's objectives—at least next to ruggedness. They told me the cylinder assembly can be removed and replaced in 40 minutes and that complete overhaul of the 6-cylinder model can be made in six to eight hours.

Accuracy of timing is assured by mounting the main timing gear just ahead of the flywheel mass on the rear end of the crankshaft. The front end take-off drives only the fan and generator.

The 3-cylinder model is given a 60 hp. rating for continuous duty at 1200 rpm. and 70 hp. likewise at 1400 rpm. This model weighs 1350 lbs. dry, but with all accessories. The 6-cylinder engine is presently rated 120 hp. at 1200 rpm., 140 hp. at 1400 rpm. and weighs 1900 lbs. Research and development is in progress for higher speeds—the P&H Diesel engine is designed for 2000 rpm. Automotive and Industrial types are now being produced, with a marine version in the making and probably to be announced by the time this appears in print.

The component parts of the engine are interesting as a key to the overall design. We find that the crankshaft is forged, alloy steel, heat treated and balanced both statically and dynamically. Crankshaft bearings are aluminum-tin alloy, main bearings being 4 in. by 1¾ in., and crankpin bearings being 3 in. by 2 in. The camshaft is a special alloy steel, forged and heat treated and the cams are hardened and precision ground. Camshaft bearings are aluminum alloy. Timing gears are helical, of high alloy, drop forged, heat treated and precision machined.

Connecting rods are drop forged, heat treated, alloy steel of "I" section, drilled for pressure lubrication of piston pin. Pistons are cast aluminum alloy and are fitted with 3 compression rings and 2 oil control rings. The cylinder head is an alloy iron casting fitted with one exhaust valve.

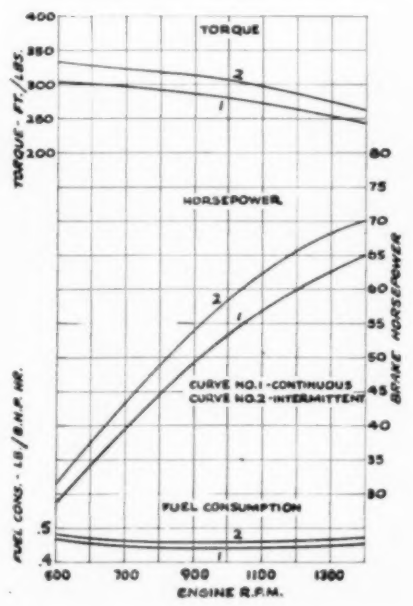
The crankcase and cylinder block are cast in one piece of high strength aluminum alloy with heavy ribs and columns for rigidity. Large inspection ports are provided on both sides of the crankcase, opposite each cylinder. The flywheel housing is S.A.E. standard No. 1, pedestal, arm-type, demountable. Lube oil pump is gear-type, driven from the crankshaft and mounted on the bottom of the crankcase at the rear end. Full pressure lubrication is provided to crankshaft, camshaft and rod bearings, timing gears and valve mechanism. The Lube oil filter is built into the front housing.

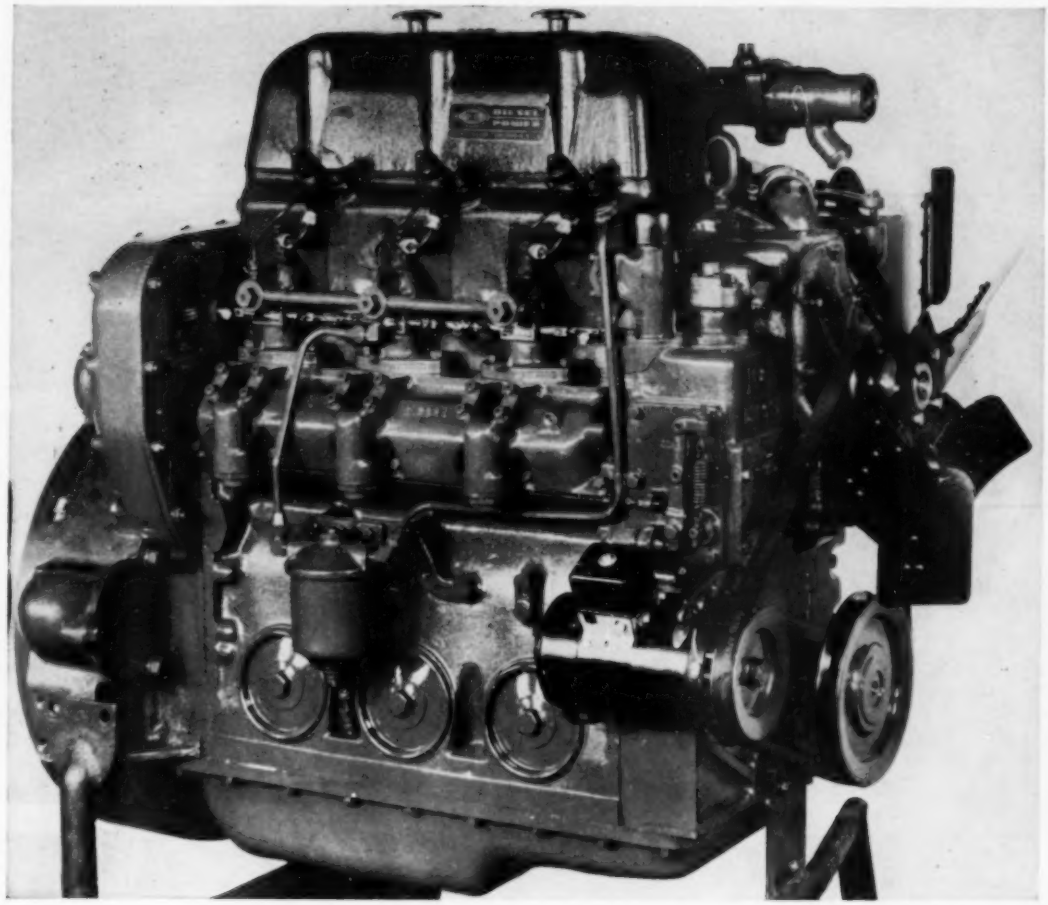
A centrifugal-type cooling water pump is mounted on the front end of the blower and is driven from the upper rotor shaft of the blower. The cooling system is radiator and fan type and is fitted with a thermostat to shorten the warm-up period. The scavenging blower is a gear-driven "Roots" type positive displacement unit.

The fuel system employs individual injection

Karl P. Schoeppner, designer of the P & H diesel, and General Manager, Diesel Division, Harnishfeger Corporation.

Torque, B.H.P., and Fuel Consumption curves for the P & H Model 387-C diesel with accessories except fan, at constant throttle (not corrected).





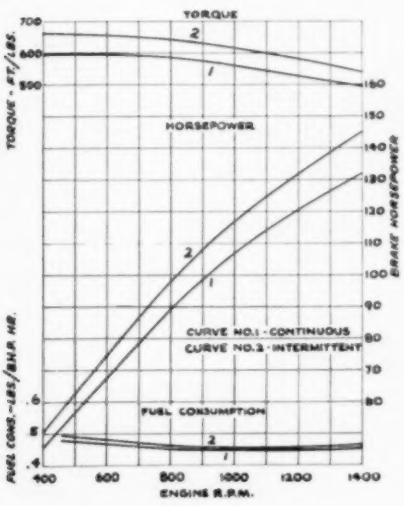
Model 387-C, 3-cylinder, 2-cycle P & H diesel with individual fuel injection pumps and rear-mounted gear train.

Consisting of liner, with copper-plated jacket, head, piston and connecting rod, this assembly, minus rod cap, can be removed from engine in 40 minutes.

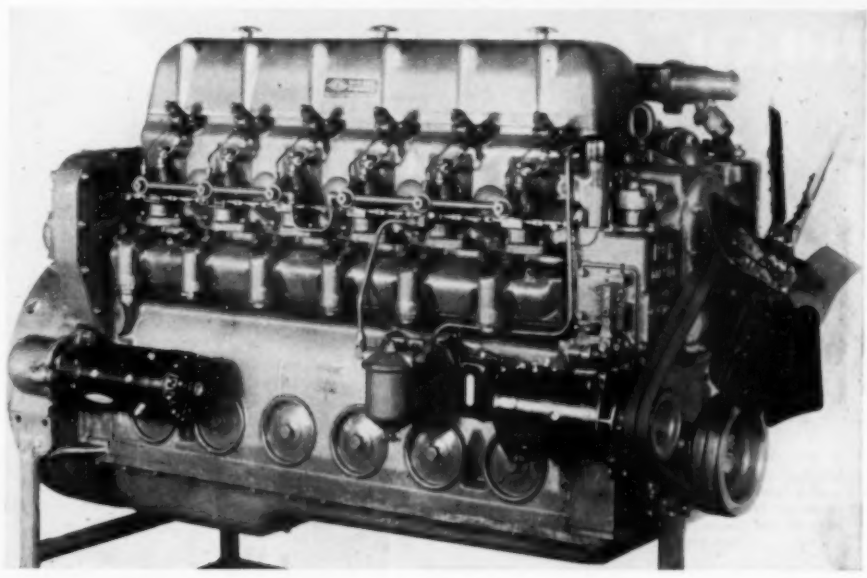
pumps which are interchangeable with any standard make. Engine is equipped with a mechanical governor, provisions are made to install a Hydraulic Governor if application warrants it. A gear-type fuel supply pump is driven off the front end of the camshaft and a fuel filter is mounted on the R. H. side of the engine. The valve mechanism is completely enclosed with a cast aluminum alloy cover. The electrical system consists of a base-mounted, belt-driven generator and S.A.E. No. 2, flange-mounted starting motor, 12 or 24 volt units being optional.

Every step in the manufacture of the P&H diesel has been ingeniously tooled not only for speed of production but for extreme control of accuracy. The pilot plant as it stands today is a complete working unit, capable of reproduction on any scale elected by the company.

Torque, B.H.P., and Fuel Consumption curves for the P & H Model 687-C diesel, 522 cu. in. displacement, without fan and generator.



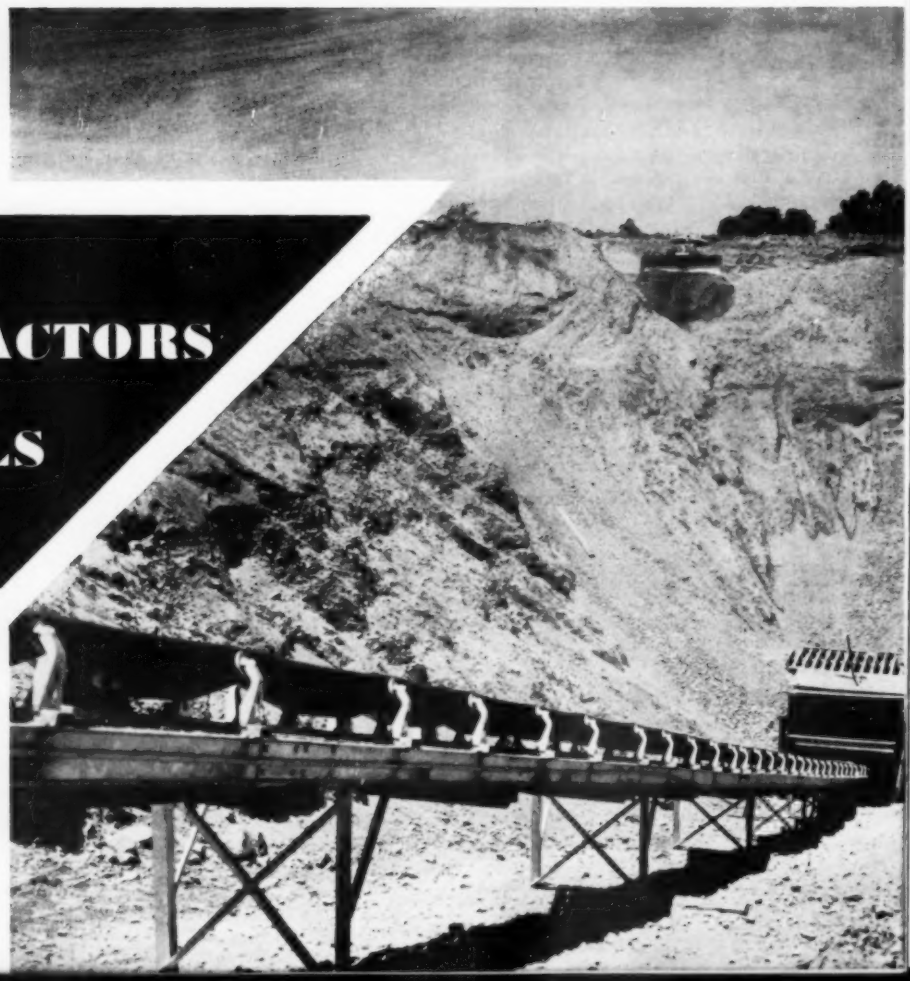
Model 687-C, 6-cylinder, 2-cycle P & H diesel which is rated 140 hp. at 1400 rpm.



Caterpillar Diesel D4 Tractor with Trackson Trascavator hauling and feeding asphalt plant with gravel. 500 tons of asphalt produced in plant each day. Near Mt. Vernon, Washington.

Another view of the plant shown above, showing the tractor moving gravel from stock pile to hopper for processing. This plant is owned by C. W. Wilder Co., Bellingham, Washington.

ROAD CONTRACTORS AND DIESELS

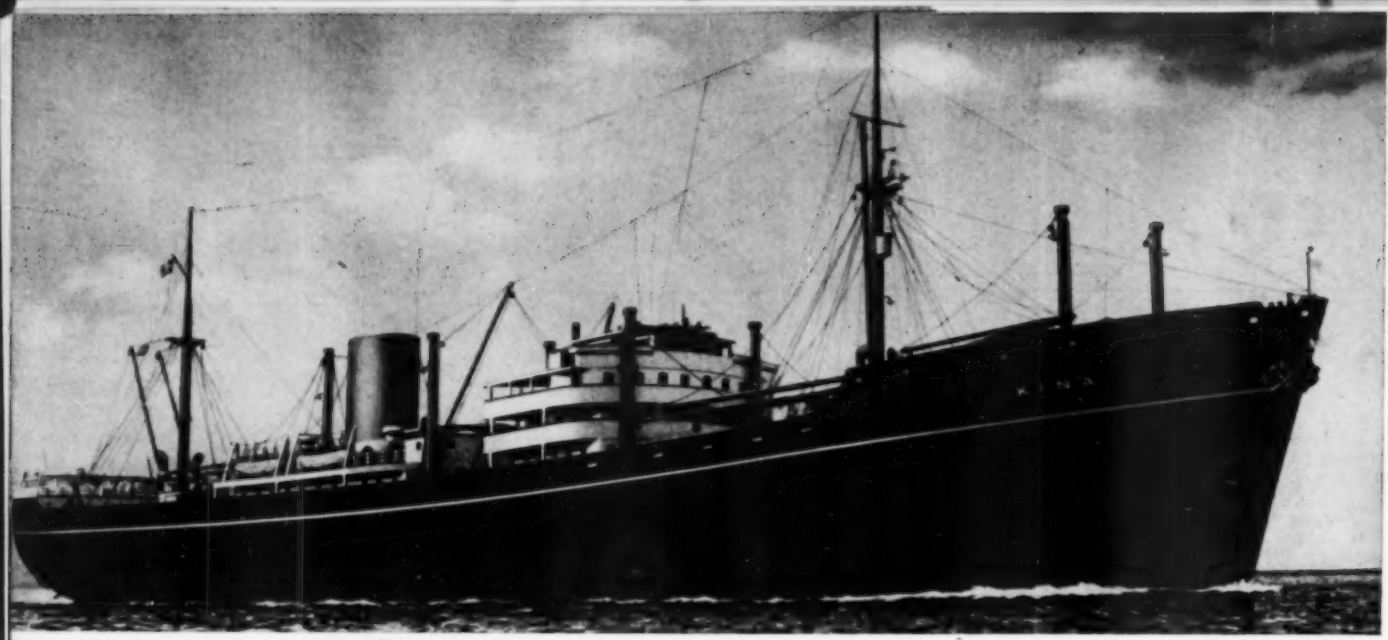


In upper center of this view is seen a Caterpillar diesel tractor with "Dozer", feeding aggregate material to conveyor. Owned by the Los Gatos Construction Company of Los Gatos, California this plant produces 200 tons per hour of aggregate.

Another view of the Los Gatos aggregate plant showing a Caterpillar tractor and "Dozer" at work in the foreground, and classifying conveyors fanning out from the grader.

Here the Caterpillar D-8 diesel tractor is trimming up an aggregate stock pile at the Los Gatos plant, near Centerville, California.

In this view the tractor with Trackson Trazcavator is dumping gravel into the hopper of the asphalt mixer. This plant is near Mt. Vernon, Washington.



New diesel ship "Kina" built by Burmeister & Wain for the East Asiatic Company Ltd., Copenhagen, Denmark.

Amply-spaced navigating bridge.

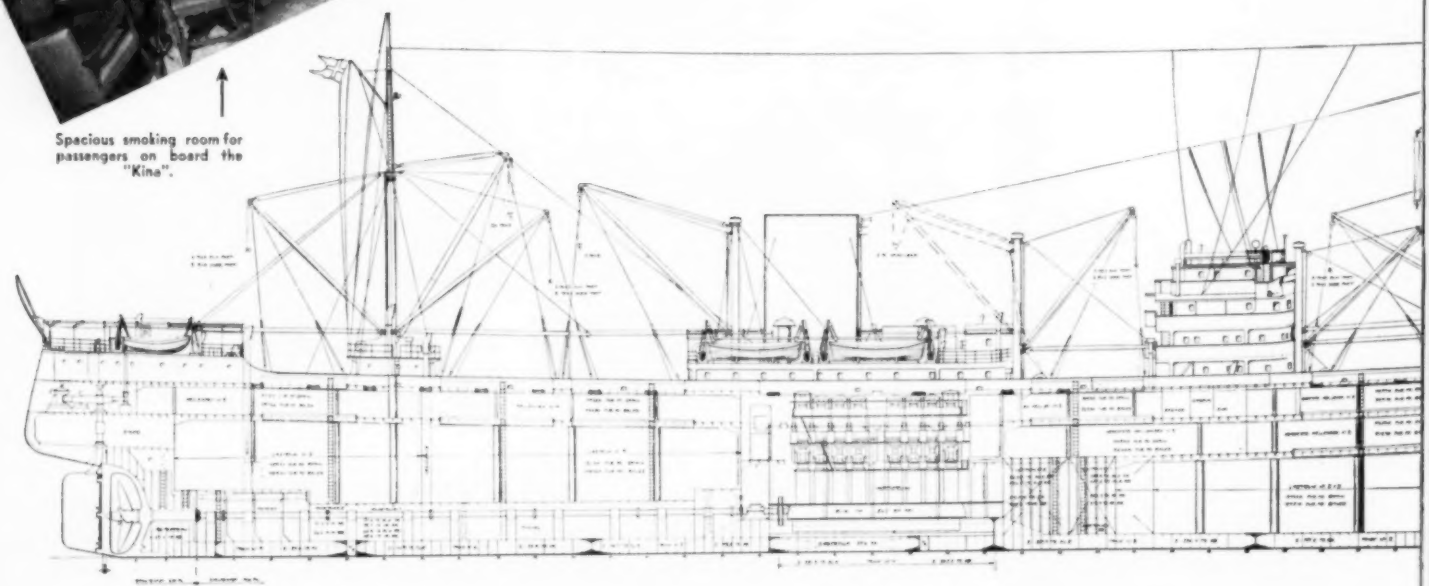
Spacious smoking room for passengers on board the "Kina".

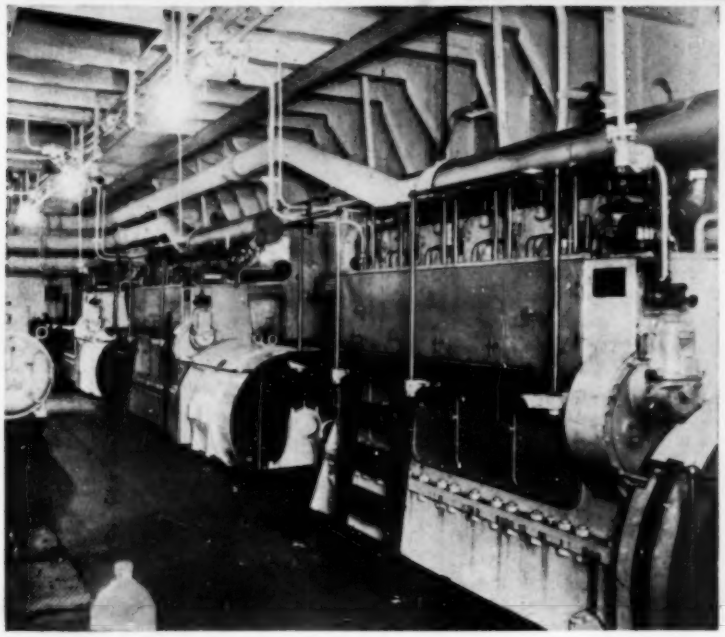
DIESEL SHIP "KINA"

THE combination cargo and passenger vessel *Kina* was recently turned over to the East Asiatic Co., Ltd. This is the second ship of this type, intended for the company's China-Japan service. *Kina* is one of the biggest single-screw motorships hitherto built. This new vessel has been built to British Lloyd's class 100-A1 as a complete superstructure vessel with the following main dimensions: length between perpendiculars—475 ft.; breadth—65 ft.; depth moulded to upper deck—41 ft. 9 in.; gross tonnage—9992 tons; draft—29 ft. 7¼ in.; speed, loaded—16 knots.

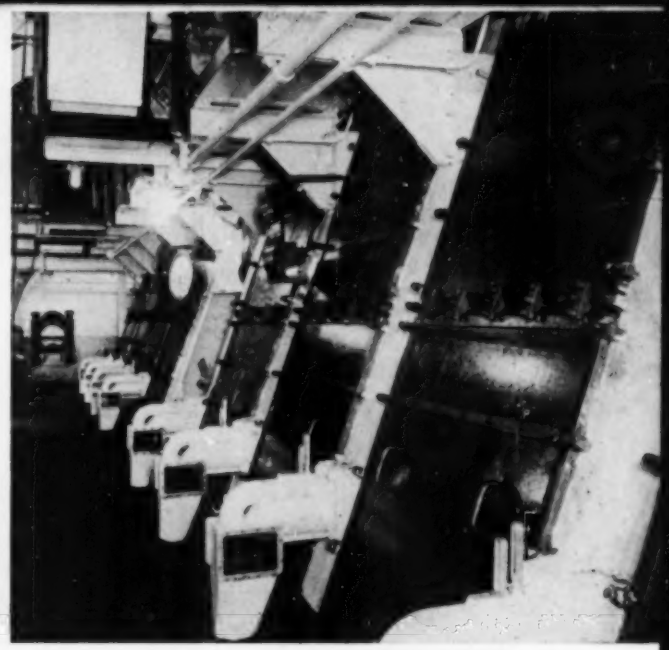
Kina has four main holds, long forecastle, four deep tanks and six hatchways. The deep tanks are for vegetable oil and hold about 1050 tons. The hatchways are served by sixteen winches and eighteen derricks.

The accommodation is arranged partly in a deck house forward between No. 2 and 3 hatches, partly in the deck house around the engine-room casing, and in the poop. There are four single cabins and four double berth cabins. The entire accommodations, for the crew as well as for officers





Auxiliary diesels aboard the "Kina". Three of these 4-stroke, 5-cylinder engines develop 255 hp. each at 425 rpm.



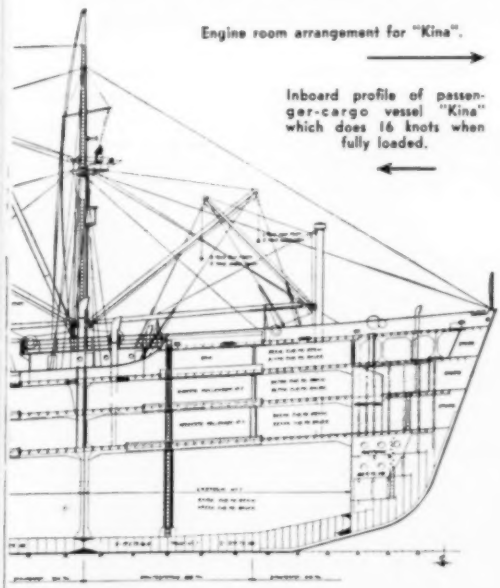
Maneuvering platform for main engine 2-stroke, 8-cylinder crosshead diesel built by Burmeister & Wain.

and passengers, are mechanically ventilated, and are heated by steam.

The vessel is provided with the newest navigation equipment, such as wireless direction finder, Sperry radar, gyro-compass and gyro-pilot. SAL log and ordinary log with electric transmission to the bridge, further magnetic and standard compasses. The starboard window of the wheel house is provided with clear view screen. Aft on the poop is an electric sounding machine for depths to 300 fathoms. The wireless station is fitted with equipment from Dansk Radio A/S comprising of short and medium waves from 0.5 to 0.75 kw. The equipment is provided with auto-alarm.

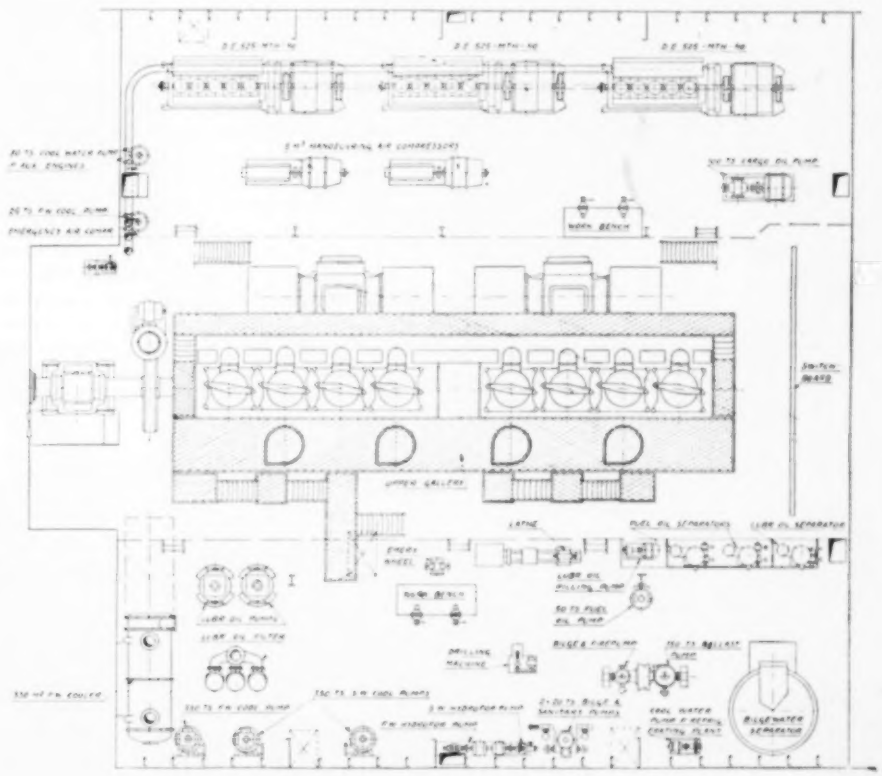
The main propulsion engine is a direct reversible, double-acting, 8 cyl., 2 stroke, crosshead Burmeister & Wain diesel. The diameter of the cylinder is 24.4 in., length of stroke 55.1 in. The engine is capable of developing 11000 ihp. corresponding to 9100 bhp. at 110 rpm. The lubricating and cooling systems for the main engine are fitted with 2 screw pumps for lubricating and cooling oil, each coupled to an electric motor through resilient couplings and each with a capacity of 330 cu. metres per hr., 2 centrifugal pumps for salt cooling water and 1 for fresh cooling water, each with a capacity of 330 cu. metres per hr.

Auxiliary engines consist of three 5 cyl., 4 stroke trunk piston units, each direct coupled to a generator of 170 kw. at 220 volts and 425 rpm. The diesel cylinders have diameter of 9.6., length stroke of 15.7 in., and the output per engine is 255 btp. For the cooling of the auxiliary engines, 1 pump for fresh cooling water of 50 cu. metres per hr. and 1 centrifugal pump for salt cooling water of 80 cu. metres per hour. Fresh water and oil coolers have steel mantle and cast iron covers.



Engine room arrangement for "Kina".

Inboard profile of passenger-cargo vessel "Kina" which does 16 knots when fully loaded.



GETTING RID OF HEAT

By WILBUR W. YOUNG

Fred M. Young, President and General Manager, Young Radiator Company

The 70,000 sq. ft. plant in Mattoon, Illinois recently acquired by the company, with sufficient land to more than double its size.

CALL it "Heat Transfer" or anything you like, we still have to get rid of heat—the extra heat that we do not yet, and may never, know how to convert into useful work. Getting rid of this extra heat, mainly that absorbed in the jacket water of internal combustion engines, and doing it efficiently, is one of the major objectives on which one organization, among many in the business, has expanded from a handful of employes to more than 800, and has spread from a small job shop into highly organized production plants of over 300,000 square feet of manufacturing area in the short span of twenty years. That is the Young Radiator Company which would have the fruits of its labors known as "Heat Transfer Products," because in reality they are used for heating as well as for cooling.

Fred M. Young organized the company in 1927, after having sold the Racine Radiator Company to Milwaukee interests. Associated with him in that year were John J. Hilt, now Vice President and Sales Manager, Walter H. Schleck, who has been Secretary-Treasurer of the company for twenty-one years, W. V. Astrup, Chief Engineer and Assistant to General Manager, and L. C. Pfost, General Superintendent. These are the men who built the company into an $8,000,000 enterprise in 1948. No use eulogizing them, however, because Fred Young, due to his ubiquity and proclivity for knowing and remembering people and for making them remember him and his organization, has done a thorough job in the industry to which this is directed.

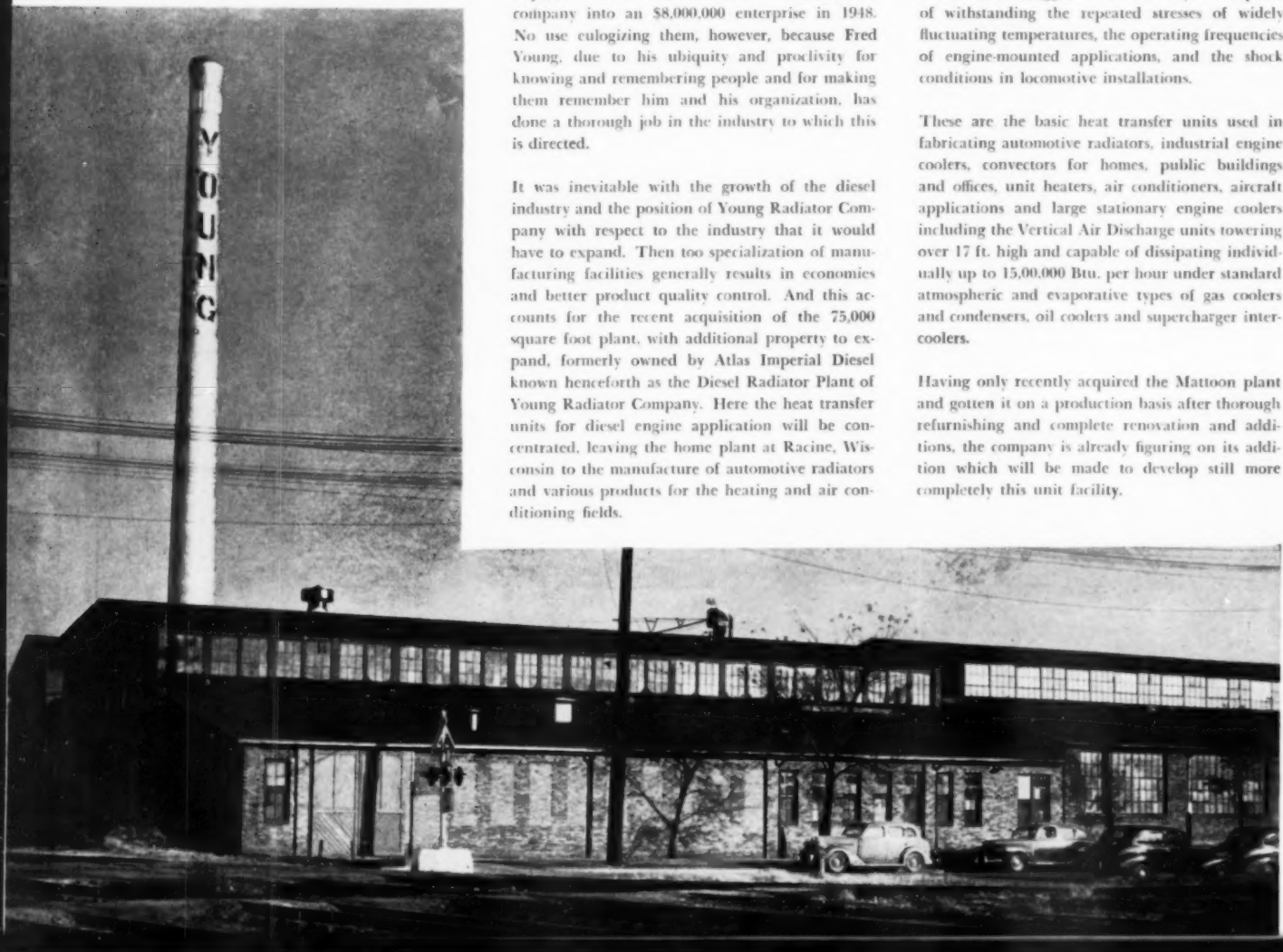
It was inevitable with the growth of the diesel industry and the position of Young Radiator Company with respect to the industry that it would have to expand. Then too specialization of manufacturing facilities generally results in economies and better product quality control. And this accounts for the recent acquisition of the 75,000 square foot plant, with additional property to expand, formerly owned by Atlas Imperial Diesel known henceforth as the Diesel Radiator Plant of Young Radiator Company. Here the heat transfer units for diesel engine application will be concentrated, leaving the home plant at Racine, Wisconsin to the manufacture of automotive radiators and various products for the heating and air conditioning fields.

In going through the steps in the assembly of a diesel engine cooling unit at the Mattoon plant the observer is impressed with the ruggedness of the finished product resulting from the assembly of extremely delicate components. To see the fin material precision stamped and formed from sheets of copper only a few thousandths thick, how it is kinked a little, dented here and there to stiffen it, form pressed to provide bearing on the tube, gives an inside picture of the craftsmanship that never comes to the surface unless we have to tear a radiator apart.

Following the fins as they are dropped into the jig which gives them the proper spacing and holds them thus as the flat solder tinned tubes are slipped in place and thence through an acid wash with the tube ends tightly sealed, then placed in the special furnace where the tubes and fins are permanently fusion bonded, we see the unit emerge as a rigid and efficient heat transfer element. By varying the numbers and lengths of fins and tubes, units of any desired cubical dimension or planned heat transfer rating may be assembled. Then suitable headers with pipe connections are built in place and the unit is properly shrouded to direct the air flow. Rugged assemblies they are, capable of withstanding the repeated stresses of widely fluctuating temperatures, the operating frequencies of engine-mounted applications, and the shock conditions in locomotive installations.

These are the basic heat transfer units used in fabricating automotive radiators, industrial engine coolers, convectors for homes, public buildings and offices, unit heaters, air conditioners, aircraft applications and large stationary engine coolers including the Vertical Air Discharge units towering over 17 ft. high and capable of dissipating individually up to 15,00,000 Btu. per hour under standard atmospheric and evaporative types of gas coolers and condensers, oil coolers and supercharger intercoolers.

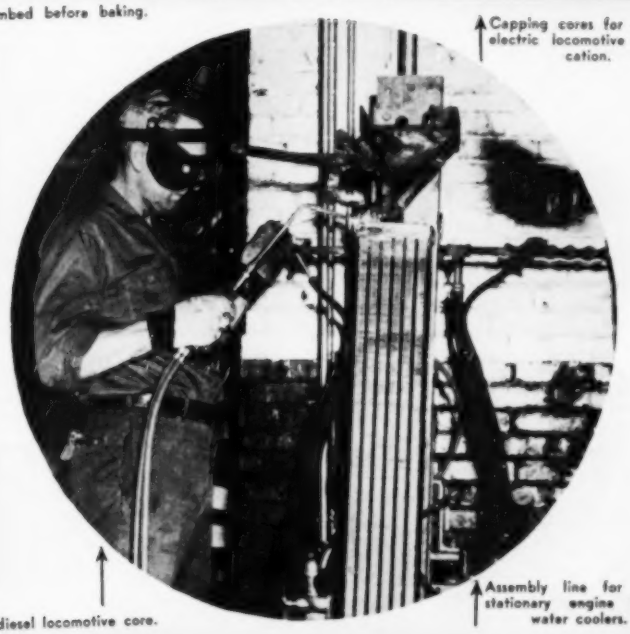
Having only recently acquired the Mattoon plant and gotten it on a production basis after thorough refurnishing and complete renovation and additions, the company is already figuring on its addition which will be made to develop still more completely this unit facility.



Inserting tubes in radiator core.

Fins are carefully combed before baking.

Assembling diesel engine radiator core.



Sweating header on diesel locomotive core.

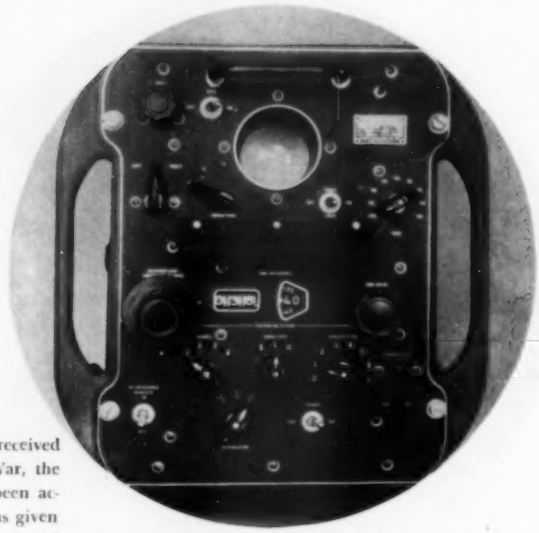
Capping cores for diesel-electric locomotive application.

Assembly line for large stationary engine jacket water coolers.

SPERRY
DIRECT-READING LORAN

By C. W. DAVIS*

** Loran Application Engineer, Sperry Gyroscope Company Division.*



Receiver-indicator panel, Sperry Mark 2 Loran, includes controls and cathode-ray tube.

FROM the time man first ventured beyond sight of land in ships he has been confronted with the problem of determining his position on the earth's surface. In the search for a solution to this age-old problem various devices and methods have been employed. The one most generally used is that of taking sights on celestial bodies with the aid of a sextant and a chronometer. This method of determining position is usually possible only in clear weather when both the horizon and the sun or stars are visible.

Prior to the last World War, radio navigational aids depended upon some form of direction finding in which the compass bearings or direction of arrival of radio signals was measured. Such bearings are usually not dependable at distances above 200 miles and are frequently subject to unpredictable vagaries of wave propagation.

Through electronic developments, which received a great impetus during the last World War, the measurement of time to a precision has been accomplished. This scientific achievement has given birth to a new, entirely different navigational aid known as Loran—an abbreviation for LOng RAnge Navigation, which marks the most important advance in long range navigation since the introduction of the gyro compass.

Loran enables the navigator to find his position on the high seas, or in the air, at any time, in darkness and fog. Fixes are obtainable over water at distances up to 750 nautical miles in daylight and 1400 nautical miles at night from shore-based Loran transmitting stations of known position. The ship's navigator can depend on Loran in the stormiest weather when knowledge of the ship's position is most urgently needed and when poor visibility prevents the use of a sextant.

Sperry Mark 1 Lorain: Capt. A. A. Berg takes reading aboard Mormacsaga. Time difference given directly in numerals.

Sperry Mark 2 Loran receiver-indicator with pedestal for deck mounting. The trunnion design permits tilting to suit the operator.

Loran was first developed at the Radiation Laboratory of the Massachusetts Institute of Technology. It was undergoing its first tests in December, 1941. By the autumn of 1942 Naval vessels were carrying out trial operations in the stormy north Atlantic where convoying and anti-submarine operations required the best possible navigation.

The system became fully operational in the spring of 1943. During 1944 and 1945 Loran coverage was extended rapidly over the combat areas and long supply lines of the central and western Pacific. By the end of 1945 over 3,000 surface vessels and 30,000 aircraft were equipped with Loran receivers.

This new navigational aid played an important role in winning the war, and its benefits are now being enjoyed by both merchant ships and commercial airlines. Of 37 Loran stations now in continuous operation, 24 are in the Pacific and 13 are in the Atlantic. The U. S. Coast Guard operates most of these. Three are operated by Canada; while the United Kingdom, Denmark, and Iceland each operates one station. Service is provided over most of the important ocean routes of the north Atlantic and Pacific Oceans.

The fundamental principle of Loran lies in the reception by a navigator at sea or in the air of radio signals emitted continuously by a pair of Loran stations from 200 to 400 miles apart. The two stations are held in synchronism by a radio link.

By means of a special receiver which functions as a very acurate electronic stop watch, the navigator is able to measure the time which elapses between the arrival of the signals from the two stations. By consulting a navigational chart or tables, the navigator determines from this time difference that he is somewhere on a particular line of positon on the earth's surface. From a second pair of stations he

Reprinted from Winter 1949 isue of Sperryscope

determines that he is on a second line of position. The ship's position is at the intersection of these two lines and the latitude and longitude can be obtained from the coordinates of the chart. No computations are required.

The special charts which contain the superimposed lattices of lines for several pairs of stations are obtainable from the Navy Hydrographer and from the U. S. Coast and Geodetic Survey. A fix can be obtained in from two to six minutes, and its accuracy is comparable to that obtainable with celestial observations under favorable conditions. A fixed relationship exists between the time of travel and distance traveled by radio waves which propagate at the speed of light. In one millionth of a second, known as a microsecond, a radio wave travels 983.2 feet. The Loran receiver is capable of measuring time in millionths of a second, which is a direct measure of the distance traveled by a radio wave during that time.

The Loran measurement evaluates the difference in the distance from the ship to each of two transmitting stations and not the total distance to either station. There are many points on the earth's surface where the difference in these two distances remains the same. These points fall on a smooth curve which is but one of a family of spherical hyperbolas with the transmitting stations as the focal points. As a result of the constant difference in distance, the same time difference is obtained everywhere on each Loran line of position.

Loran transmitting stations operate on a frequency of 1750, 1850, or 1950 kilocycles. All thirteen stations in the Atlantic operate on 1950 kilocycles. Each pair of stations emits pulses at a different rate (such as 25, 25-1/16, or 25-1/8 pulses per second), and the receiver makes it possible to identify the stations by their pulse recurrence rate. The signals from the two stations are viewed on a cathode-ray tube and appear as two vertical lines of light. The measurement of time difference is accomplished by manipulating knobs on the control panel to superimpose the two signals.

The Loran receiver produced by the Sperry Gyroscope Company is unusual in that the moment the signals have been superimposed, or "matched," the time difference can be read from numbered dials on a meter. The various Lorans in use during the war were of the "pip counting" type in which the time difference was obtained from the cathode-ray tube by the process of counting, multiplying, and adding time markers.

The direct-reading feature, developed and first introduced by Sperry, represents a distinct advance in the art as it eliminates the mental computation involved in obtaining the time-difference reading, and it also greatly reduces the chances of human error.

Sperry became interested in Loran development as early as 1940 through company representation on the National Defense Research Committee. Sperry engineers undertook the job of developing a Loran which would be fully automatic. By the end of 1943 they had produced a receiver which automatically gave a continuous indication of the time difference. Navy representatives witnessed a demonstration of a working model in a station wagon on Long Island at Oak Beach in February 1944. At that time the device was not sufficiently developed to put into production. However, based on the automatic development, Sperry was asked to develop a Loran in which the pulses could be selected and matched by hand, but in which the time difference could be read from numerals on a meter.

The Sperry Mark 2 Loran may be table-mounted as is here being demonstrated by Capt. W. R. Griswold, who tested the device aboard Sperry's floating laboratory, hte *M/V Wanderer*.

A redesigned model of a direct-reading Loran was demonstrated to representatives from the Navy exactly one month after the demonstration of the automatic model. In April 1944 Sperry received a contract to produce six experimental direct-reading Loran receivers. Several units were undergoing trials the latter part of 1944. The design received Navy approval, and a contract was awarded to manufacture 200 production Model DBE Lorans. An additional contract was awarded Sperry to produce 2,000 Lorans but, as a result of the war's termination, only 200 were actually produced.

On November 28, 1945, the Chief of Naval Operations gave the Sperry Gyroscope Company permission to advertise and sell to commercial customers Loran receivers similar to the Navy Model DBE units. To investigate the peacetime possibilities for the new device 110 commercial Lorans were built and sold under the designation Mark 1, Mod. 1.

At first, commercial customers were somewhat skeptical, but those who tried the new direct-reading Loran soon gave it their hearty endorsement. Early in 1947 work began on the development of an improved version of the Mark 1 Loran that would be smaller and better suited for commercial vessels.

Preliminary models of different designs were tested out at sea in the summer of 1947. It was decided to place one of these designs in production and several pre-production units were built before the new Mark 2 Loran was actually placed in production.

The new Mark 2 Loran is direct-reading and possesses a number of advantages over its predecessor.

The size has been reduced through the use of miniature tubes and by separating the power supply from the receiver-indicator. It is particularly suited for installation in smaller vessels where

. . . . . *And now please turn to page 64* . . . . .

CUMMINS GOES ON UP TO 550 H.P.

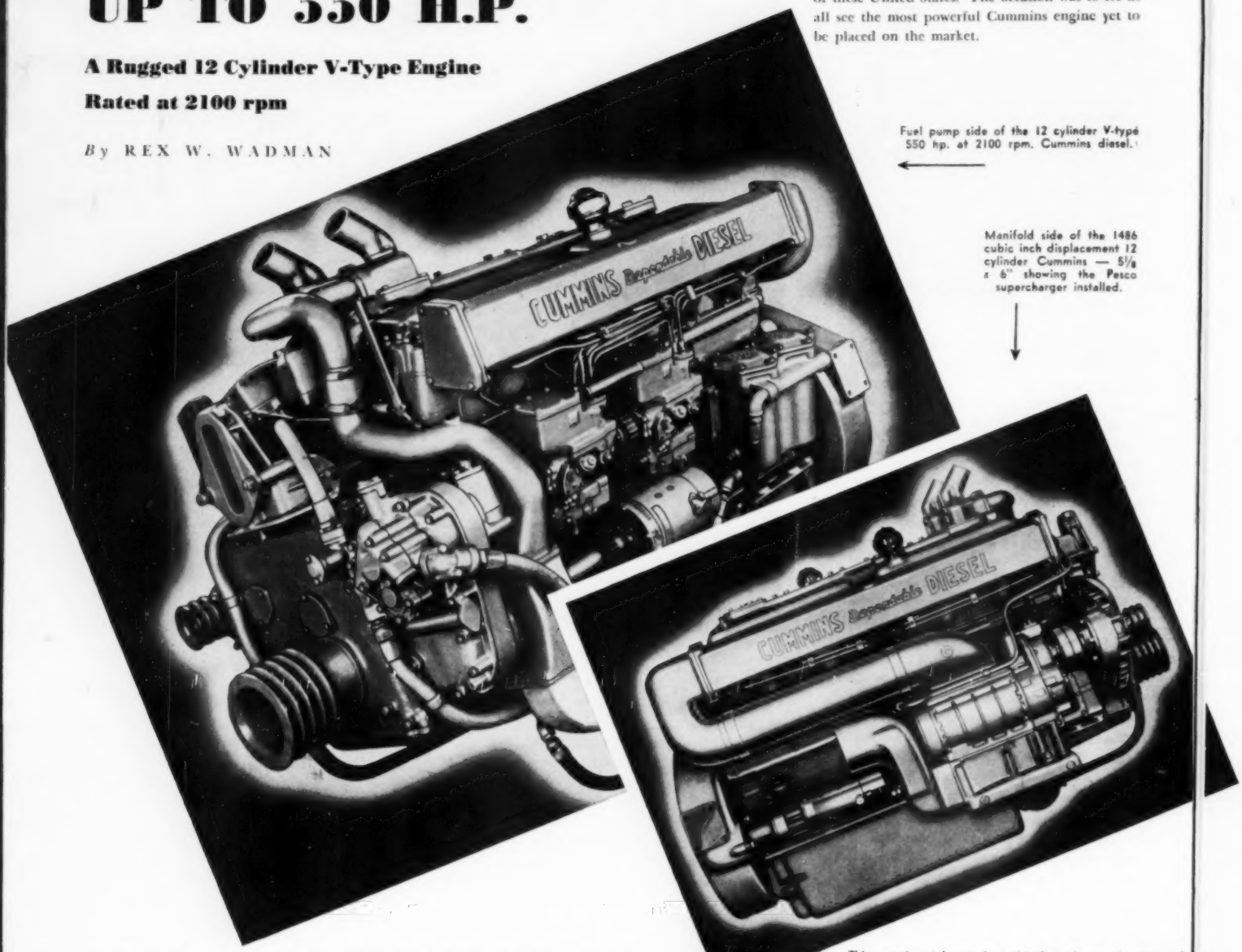
A Rugged 12 Cylinder V-Type Engine Rated at 2100 rpm

By REX W. WADMAN

COLUMBUS, Indiana, March 17, 1949—One of the most impressive new model unveilings that I have ever attended took place here today with some sixty editors from the leading business papers of these United States. The occasion was to let us all see the most powerful Cummins engine yet to be placed on the market.

Fuel pump side of the 12 cylinder V-type 550 hp. at 2100 rpm. Cummins diesel.

Manifold side of the 1486 cubic inch displacement 12 cylinder Cummins — 5⅛ x 6" showing the Pesco supercharger installed.



This 65-ton General Electric diesel electric locomotive was used as a testing field laboratory for the 12 cylinder 550 hp. diesel. This locomotive is operating in the Sparrows Point, Maryland, plant of the Maryland Slag Company.

This experimental rear dump Mack truck was also powered one of the new supercharged 550 hp. Cummins engines and being tested by M. A. Hanna Company on the Mesabi Range in Minnesota. This truck carries 30-ton payload

We saw the engine being machined in the modern, well-equipped machine shop. We saw the fuel pump going through its manufacturing process and that is an education in itself. Then we saw the new engine going through the assembly aisle and finally we saw it on the test stand turning up its 2100 rpm. and delivering its 550 hp.

We were treated to a liberal education on the intense care which surrounds all manufacturing operations not only of this big new Cummins diesel but of all Cummins diesels. I was particularly impressed with the money which has been spent for testing equipment and checking equipment and the splendid system which goes right through the shop of check and double check to insure a high quality in the finished product.

It is several years since I have been through the Cummins shop in detail as I did here today and I marvel at the growth of this company, how large their manufacturing facilities have become and how truly modern both in their machine tool equipment and in their methods. The Research Laboratory alone is worth a day. It is located in a separate building, splendidly equipped and equally well manned by men who know how to develop new products, how to solve service problems which crop up in the field, as they do with any engine.

To get back to the new engine itself, the new Model NVHS-1200 Cummins diesel is possibly the most powerful high-speed diesel in production at the moment, at least it is one of the largest I have seen to date. It is a four-cycle, 12 cylinder, V-type, supercharged unit rated at 550 hp. at 2100 rpm. A compact, rugged, powerful new engine.

It has, of course, been thoroughly tested in the shop and it has also been tested in the field going back over nearly two years and several pieces of equipment which have been used for testing this 12 cylinder engine are shown at the bottom of these two pages.

With its companion Model NVH-1200, a naturally aspirated four-cycle, 12 cylinder, V-type diesel having a maximum rating of 400 hp. turning at 2100 rpm., these latest engines provide operators of automotive, off-highway and industrial equipment the advantages of highspeed diesels in the higher horsepower range. The new Models NVHS-1200 and NVH-1200 have expanded the horsepower range of single unit Cummins diesels now available from the former limits of 58 hp.—275 hp. (maximum) to the current line of 58 hp.—550 hp. (maximum). Coming within this increased horsepower range are 46 different models of Cummins diesels powering heavy-duty equipment in the automotive on-and off-highway, mining, construction, logging, petroleum, locomotive, marine and other industrial fields.

These new Models NVHS-1200 and NVH-1200 are designed for use in off-highway automotive units, other mobile mining and construction equipment, shovels, cranes and draglines, industrial locomotives and railcars, logging equipment, oil well drilling rigs, generator sets, and other portable and stationary applications, marine models of these new engines are expected to be available at a later date.

These new engines are equipped with a completely new fuel pump, a refinement of the exclusive Cummins fuel system. The single plunger of the new pump measures the fuel charge for all cylinders, assuring that each injector receives the proper predetermined amount of fuel at any required engine speed and load within the approved ratings. The fuel is delivered to the injectors at low pressure through a rotating distributor disc arrangement. The new pump contains a double disc arrangement from which it gets its name the "DD" pump. One disc allows fuel to pass into the metering pump, while the other performs the distributing function only.

The 12 cylinder, V-type engine that we looked at so thoroughly here today is in effect a pair of 6 cylinder 5½ in. x 6 in. type NHB mounted on a common base. The cylinders are set at a "V" angle of 40° and they are slightly staggered, the right bank being a bit ahead of the left bank. This allows the connecting rods to be mounted side by side on the crank pins and avoids the costly forked or articulated rods, thus permitting the use of conventional rods which are exactly the same for both banks. The cylinder block itself is of high strength allow iron and was designed for rigidity and to minimize the foundry work.

Full force lubrication to all bearings is by filtered and cooled oil circulated by gear pump and sufficient oil is carried in the system to act as a bearing coolant as well as a lubricant.

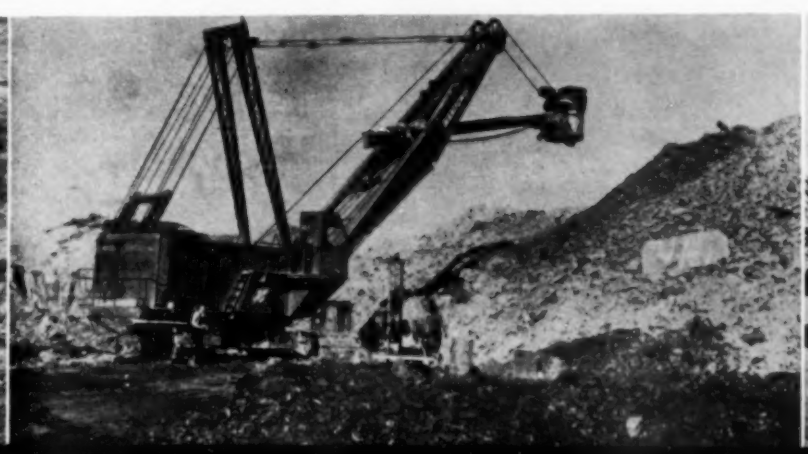
The pistons are of heat treated aluminum and incorporate very definite Cummins research developments. The piston skirts have an interrupted surface in a diamond pattern which provides lubrication to keep wear at a minimum and has proven resistant to scuffing and seizure. Piston rings are of Keystone section to better combat the sticking tendencies sometimes prevalent in present day fuels. The top ring, which takes a lot of the load, is chrome faced for long life.

On the supercharged version of this new 12 cylinder highspeed diesel, a conventional Roots type positive displacement supercharger built by the Pesco Division of Borg Warner is used. This same type of supercharger has been in successful service on other Cummins diesels for several years.

The fuel system is, as stated earlier, typically a Cummins system. Two pumps, each one serving 6 cylinders, are driven together but timed to the two banks. The speed is controlled manually but is maintained at idle by a low speed governor, and at maximum speed by a high speed governor. In addition, there is of course an overspeed trip and by the built in characteristics of the fuel pump, the speed is limited in the event of a line failure. To briefly recap, the bore is 5½ in., the stroke 6 in,. number of cycles 4, piston displacement 1486 cu. in., rated 550 hp. for the supercharged engine, and 400 hp. for the unsupercharged engine, both ratings at 2100 rpm., compression ratio for the supercharged unit 13.5:1, for the unsupercharged engine 15.5:1, engine length 73 in., width 41 in., height 57 in., weight 4550 lbs. for the supercharged unit, 4300 for the unsupercharged. All in all, a compact powerful packet which I prophesy will find a ready market in the heavy construction field, in the marine field and as a generating plant throughout industry, a worth while contribution to the art of building better, lighter, more efficient diesel engines.

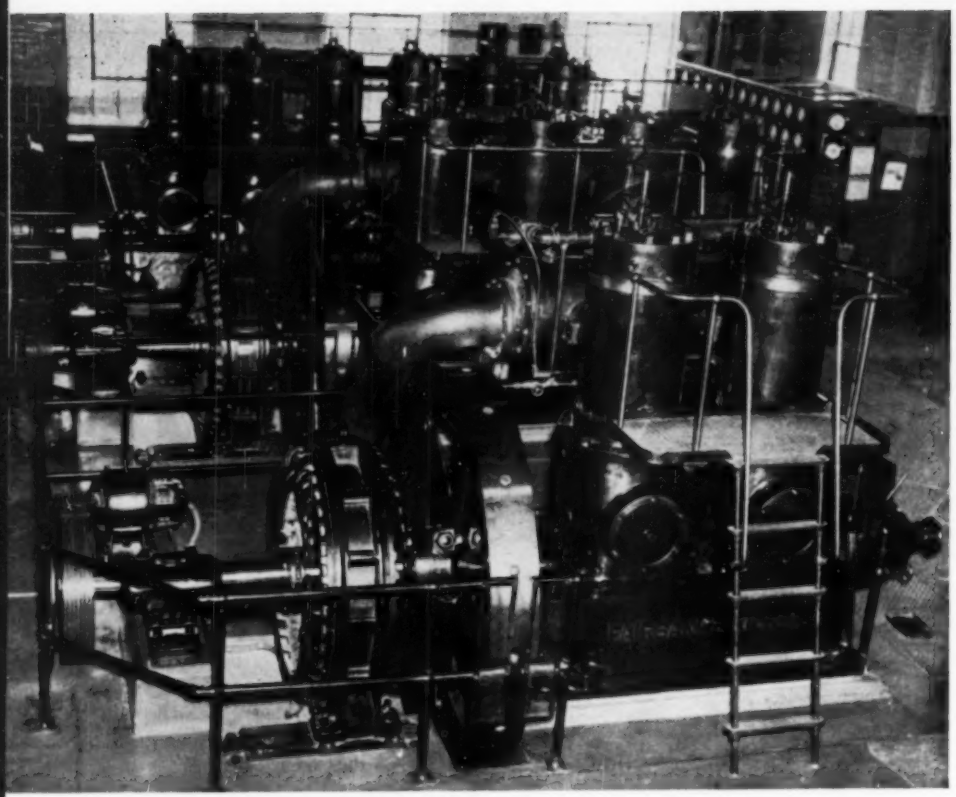
The Superior Coal Strippers, Inc., Terre Haute, Indiana, cooperated with Cummins in installing one of these new 12 cylinder diesels in Model 4500 Manitowoc shovel with a 3½ yard bucket but also able to handle a 5 yard dipper.

An experimental 40-ton rear dump Euclid, also owned and operated by M. A. Hanna Company on the Mesabi Iran Range, tested the new 12 cylinder Cummins—successfully.



DIESEL PLANT BLOOMS IN BLOOMING

By T. J. MALONE

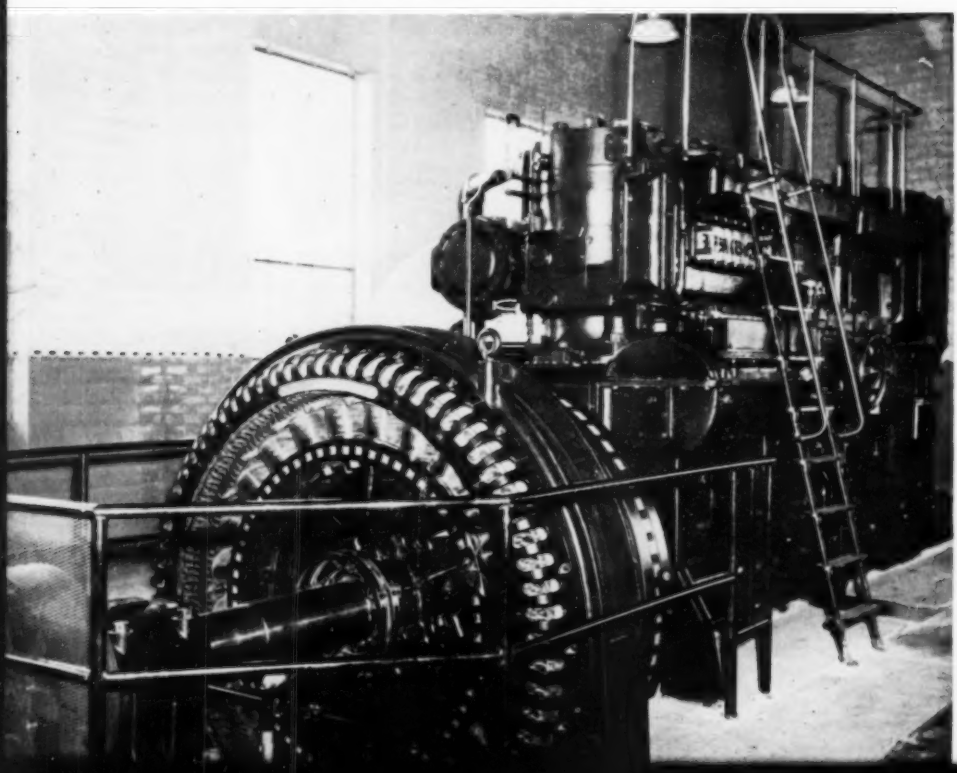


The other three F-M diesels—120, 240 and 450-hp—which accounted for all production of energy up to August, 1948, when the new 1000-hp. went into operation.

PEOPLE in Blooming Prairie, a southeastern Minnesota village of 1,400, have reason to know that when a woman gets her mad up something is bound to happen. That something may center in one person, as a man, or may affect an entire community. The Carrie Nation of Blooming Prairie was the editor of its weekly newspaper. Her anger drove her to arouse, persuade, convince, impel the community into voting for, building owning and operating a municipal diesel electric plant in Blooming Prairie.

That was way back—back in 1930 or thereabouts. A transmission-line utility was serving the village with electricity. It had succeeded a local steam generating plant. The editor's pet aggravation was the occasional failure of the high-line's current on press day. The editor broke into print about it, voicing the sufferings and convictions of many subscribers as well as her own. She proposed a remedy.

The municipal plant began operating in April, 1931, with two diesel engines of 120 and 240 horsepowers and a rated alternator capacity of 227 kilowatts. In its first twelve months it produced 311,343 kilowatt hours of energy. A third diesel unit was put in operation in December, 1937, of 450 hp. and 300 kw., and a fourth in August, 1948, of 1,000 hp. and 690 kw. The fourth unit gave the plant setup a reserve capacity of 757 kw. over the latest peak demand. All diesels were supplied by Fairbanks, Morse & Co. In the calendar year 1947 production totaled 1,474,427 kwh. Production for 1948 passed 1,800,000 kwh.



The new 5-cyl., 1000-hp. F.M. diesel engine.

PRAIRIE

Earnings of the plant, dating from the first day of operation, have retired, with interest, all debt obligations when due or, at times, even before. Besides, they have paid for various capital purposes not cared for by borrowing, as extensions to the distribution system, landscaping of grounds and purchase of equipment and supplies.

"Plant Earnings To Clear Up Debt In Fifteen Years Time" ran a headline in the local paper late in 1937, including in "debt" the investment in the third diesel and accessories made last year. The total investment in power house, generating units and distribution system at the time was $137,836. The outstanding debt, in revenue certificates, totaled $75,948. The original debt had been reduced at the rate of about $9,000 a year—all out of earnings.

The "fifteen years" of the headline would end with 1946. The plant did better than that. It had paid all debt four or five years before buying the latest diesel unit in 1947. Table I presents the story of the full ten years of three-engine operation and some data for nine months of operation in 1948—the last two with four engines.

For upwards of five years the plant superintendent, I. E. Mack, has been buying a high-grade crude oil and putting it through a Honan-Crane filter. The yearly average per-gallon outputs indicate no loss of potential in the processed oil. Crude was costing him 12 cents in November, 1948.

Year	Gross KWH volume generated	KWH per gal. of fuel oil	Av. generation cost per KWH	Av. cost delv. per KWH gen'd	Av. revenue per KWH gen'd	Peak load, KW.	Rated KW cap'y
1938	740,225	10.41	1.26 cts	1.69 cts	3.75 cts	260	527
1939	793,010	11.20	1.48	1.66	4.42	240	527
1940	858,677	10.78	1.77	1.77	4.20	280	527
1941	934,215	10.89	1.22	1.51	3.43	310	527
1942	974,485	11.12	1.02	1.46	3.33	280	527
1943	985,492	10.99	1.15	1.55	3.28	280	527
1944	1,098,042	11.24	1.45	1.73	3.16	300	527
1945	1,135,092	11.20	1.15	1.51	3.14	325	527
1946	1,257,826	11.10	1.48	1.67	3.01	382	527
1947	1,474,427	11.65	1.49	1.80	2.86	450	527
1948							
9 mos.	1,275,000	11.36	.....	....	....	460	1,217

Table I

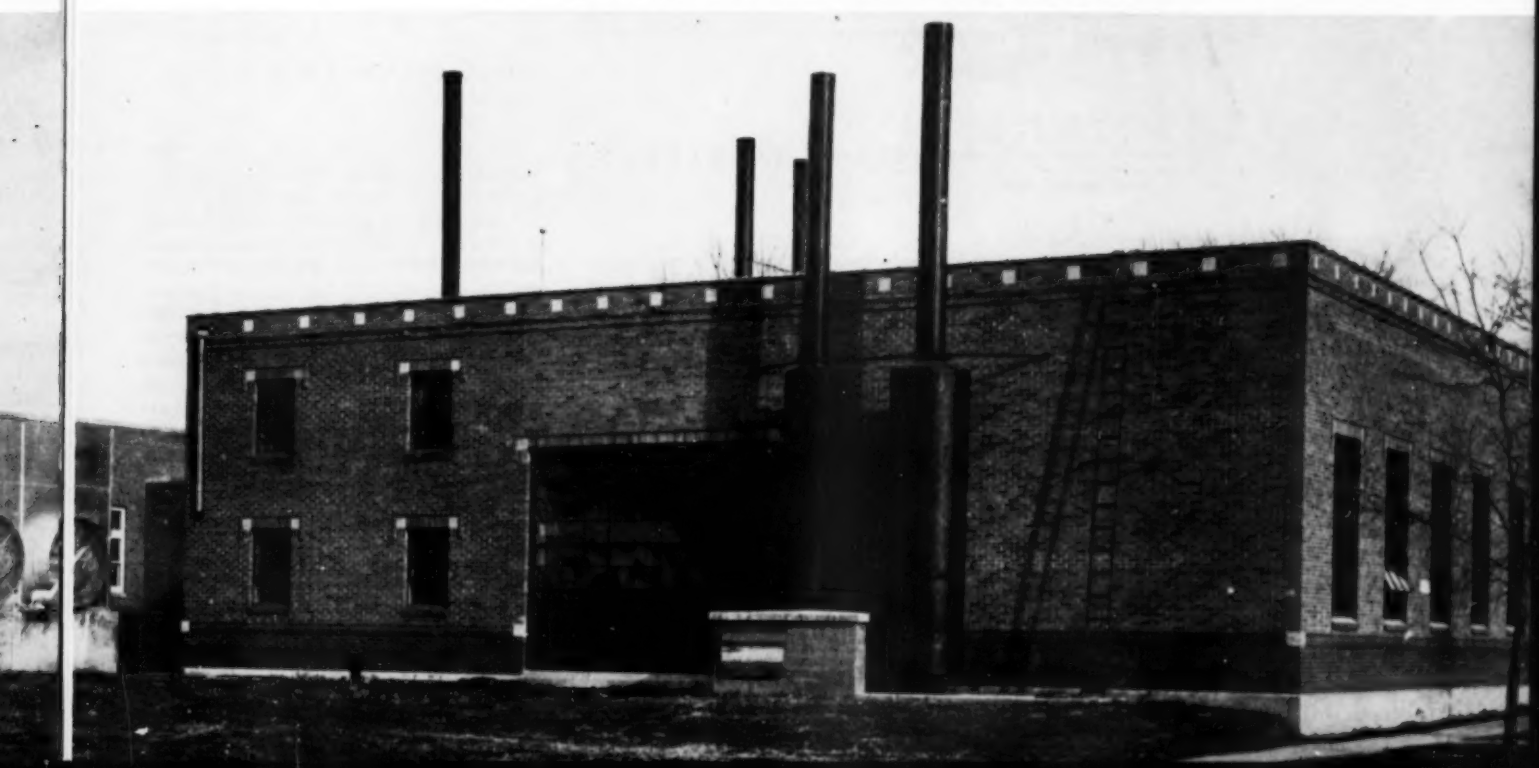
Of the 1947 volume distributed, 482,254 kwh. went to residential, 358,171 kwh. to commercial light, 135,748 kwh. to power, 229,659 kwh. to water heating. Water pumping, which is billed and paid for, street lighting, paid for in part, and certain free services account for the rest of distribution. The village pays the light fund $100 a month on street lighting and the plant absorbs the rest of its cost, about $200 a month. Energy goes free to the Community Building, park, skating rink, fire hall and school athletic field. That field enjoys the distinction of being the only village service that has received a permanent transfer of funds from electric plant earnings. The amount was $1,500, a contribution to make the field possible.

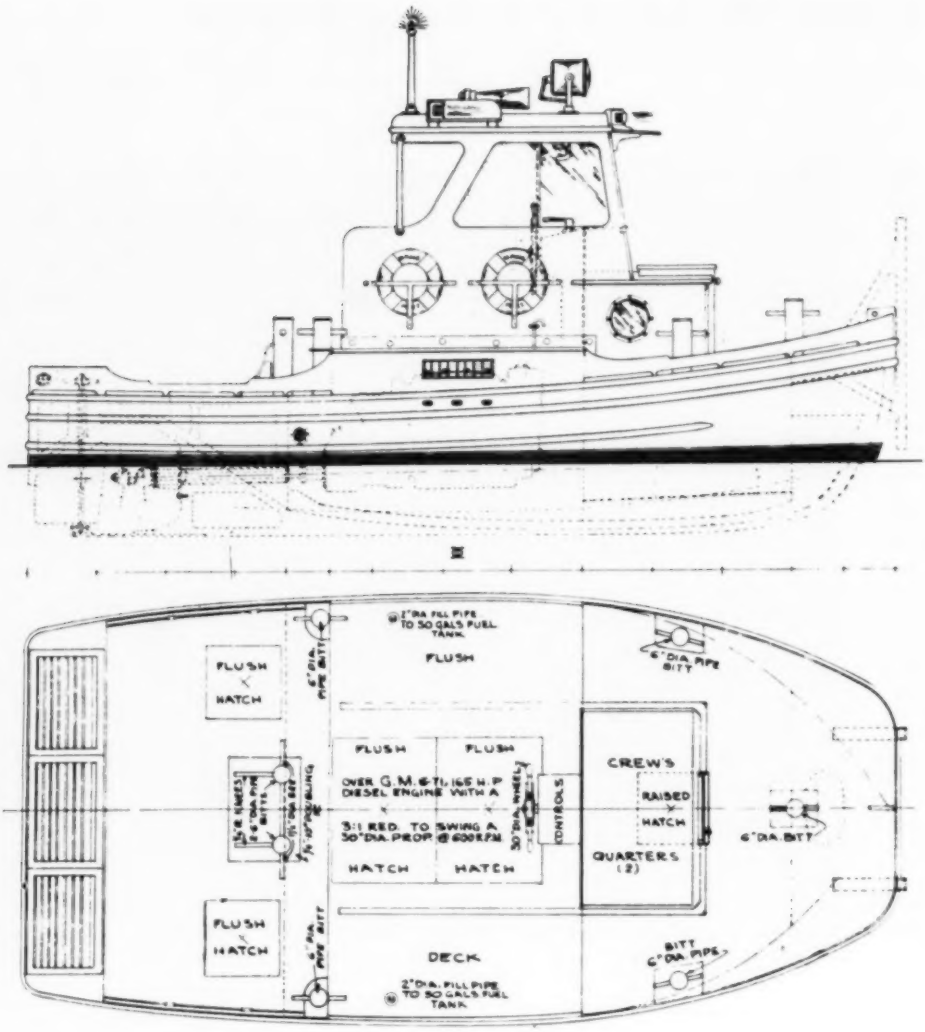
Free services given the Community Building, five in all, are peculiarly within the province of a municipal plant. They reveal the social-mindedness of the plant's directing authority and of the community as a whole, and point the flexibility of use that may attend municipal control.

A word more on the financial record of the municipal plant. On December 31, 1947, overall valuation of the physical plant (capital investment in) stood at $172,699, without depreciation. This amount took in building and site, generating and other equipment, and distribution system. A total of $78,558 in revenue certificates had been issued and retired. Current assets amounted to $43,494, including $13,690 in United States bonds. Operating expense in the year 1947 was $26,646, operating revenue $42,359, operating profit $15,712. With the recent improvements—building addition and new diesel unit—cared for by an issue of $80,000 in revenue certificates, the 1948 overall valuation of the physical plant, excluding depreciation, rose to $252,699.

As little acorns grow into great oaks, a seed idea led to the thriving, dependable, profitable, municipally owned, community serving, diesel electric generating plant that blooms in Blooming Prairie, a southeastern Minnesota village.

View of the power building at Blooming Prairie, Illinois showing Maxim silencers.





Two views of proposed pusher towboat.

TUNNEL STERN PUSHER TOWBOAT

By WILL H. FULLERTON

A 25-FOOT towboat of the pusher variety is the latest design from the board of naval architect Frank J. Schmid. Termed the *Little Giant* by its originator, the towboat represents his ideas on what a small commercial steel towboat should be. It is designed especially for shoal water operation with a draft, fully loaded, of 2 feet 3 inches. The beam is 12 feet. Displacement is 7.23 tons.

In application the proposed vessel seems ideally suited for South American operation especially in the shallow rivers which are plied so extensively by the oil companies today. It is small enough to be carried aboard larger vessels or barges for ocean travel.

The design calls for a General Motors 6-71 165 hp. diesel driving a 30-inch, three-bladed propeller at a 3:1 reduction. The designer believes that this power plant will give the *Little Giant* a speed of 12 knots running free and the ability to handle a 700-ton tow against a 5 knot current.

The plans for the vessel call for an all-welded mild-steel hull. The topsides and deck will be ⅛ inch plate, the bottom will be 7½ lb. plate and the keel is specified as 20 lb. plate. Frames, deck beams and longitudinal stiffeners are 1½x-1½x3/16-inch "T" stock and chine bars are 1-inch OD stock. Her construction is rugged.

Like her larger sisters the little towboat has a multiple rudder installation, three rudders in fact, which are hung on 2-inch bronze or monel stocks. The propeller shaft is 2½-inch bronze or monel metal. This shaft is housed in a flax-packed Columbian Bronze shaft log and stuffing box.

The engine is set on a frame of 4x4¼-inch angle iron. The exhaust is carried overboard by an insulated 4-inch O.D. bronze pipe. The bilge pump and battery charger will be belt driven off the main engine. A Maxim exhaust silencer is specified. Port and starboard fuel tanks each with a 50-gallon capacity are included in the plans.

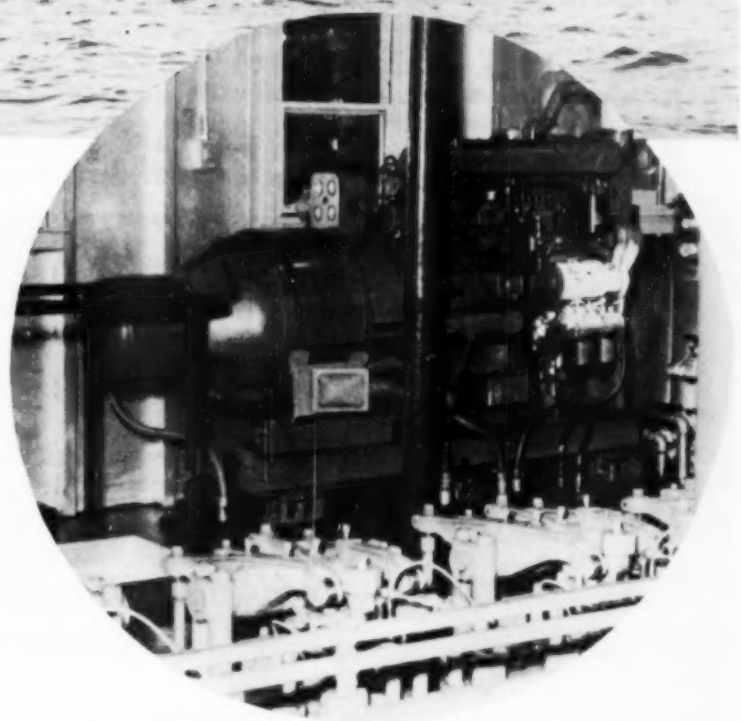
The pilot house will be framed with 2x4-inch oak and planked with ¾-inch resin bonded waterproof plywood. Mounted on the pilot house will be a searchlight and an electric horn.

This little boat should prove very popular in many phases of marine application.

"Calumet" the 103' Atlas powered towboat for the Central Barge Company.

CALUMET BUILDS A NEW ONE FOR CENTRAL BARGE

By DWIGHT P. ROBISON



One of the two U. S. Motors Corporation generator sets aboard the "Calumet" rated at 63 KVA for parallel operation. Notice the generator sets are mounted on the upper engine room deck just above the level of the valve mechanism of the 6 cylinder Atlas Imperial Diesel.

THE Calumet Shipyard & Drydock Company of Chicago delivered a single screw towboat to the Central Barge Company last November. This efficient workboat measures 103 ft. x 26 ft. x 9 in., with an overall draft of 6 ft. 8 in. The main engine is an Atlas Imperial Turbocharged 850 hp. at 300 rpm., 6 cyl. 15 in. x 19 in. and throws an 82 in. cast steel propeller on a 7 in. shaft.

The U. S. Motors Corporation provided the two generator sets rated at 63 kva. for parallel operation. These two generator sets are located on the upper engine room deck, separated by the main switchboard. This arrangement allows more room on the lower engine room floor, permitting better maintenance and operation.

Because of the large number of bridges which have to be negotiated by the *Calumet* in its daily operations in and around Chicago, the ship has a retractable pilot house which can be raised to the extent of 8 ft. The normal or operating position of this pilot house is fully extended so as to allow the pilot a better view of his tow. When low or stationary bridges are encountered, the pilot can quickly lower the house so the tow can pass under the bridge without difficulty.

The accommodations on the *Calumet* are very well laid out with every convenience for the crew of 16 provided. The cabins are heated by a hot water system, all are equipped with electric fans, venetian blinds and inlaid linoleum tile on all floors. There is a bath between each two cabins —an unusual feature on a towboat of this size. A small but compact laundry, equipped with an automatic washing machine is located on the main deck. The galley is likewise modernly and completely equipped with an automatic dishwasher, stainless steel sinks, a 10 cu. ft. deep freeze unit, 6 burner gas-fired range, a 30 cu. ft. refrigerator and an electric water cooler. Other features of the *Calumet* are its loud speaker system, enabling the captain to keep in touch with his crew from one end of the ship to the other, a five-station intercommunicating telephone system, air operated winches, electric capstan, two-ton davit and electric controlled steering.

As mentioned above, the main engine is an Atlas Imperial, the two generator sets are from the U. S. Motors Corporation, the air compressor is Quincy, the lubricating oil cooler is a Rosso, the lube oil clarifiers are Briggs, the spark arrestors are Burgess-Manning. All in all, the *Calumet* is a worthy addition to the workboat fleet in and around Chicago.

NEW "LUXURY LINER"

A NEW, 37-passenger "Luxury Liner" intercity bus, offered with Cummins diesel engines, has been introduced by C. D. Beck and Company, Incorporated, Sidney, Ohio.

The recently-introduced Model HRB-600 Cummins diesel engine powers the new Beck "Luxury Liner." This six-cylinder engine, which develops a maximum of 165 hp. at 1800 rpm., is mounted in the rear of the bus and drives through a Fuller Transmission. The Beck Company designed this luxurious intercity bus to meet the requirements of today's operating conditions. It incorporates the finest in passenger-appealing appointments and comfort, and also offers the utmost in road performance with the Cummins diesel engine.

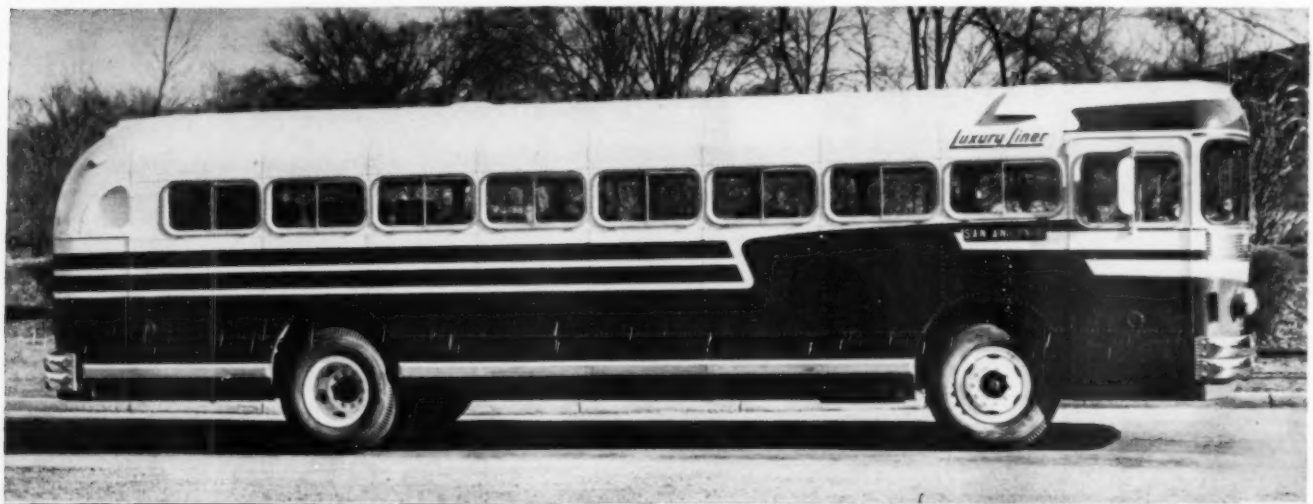
An outstanding advantage of the Cummins-powered Beck bus is the fuel economy which is made possible by the exclusive Cummins Fuel System.

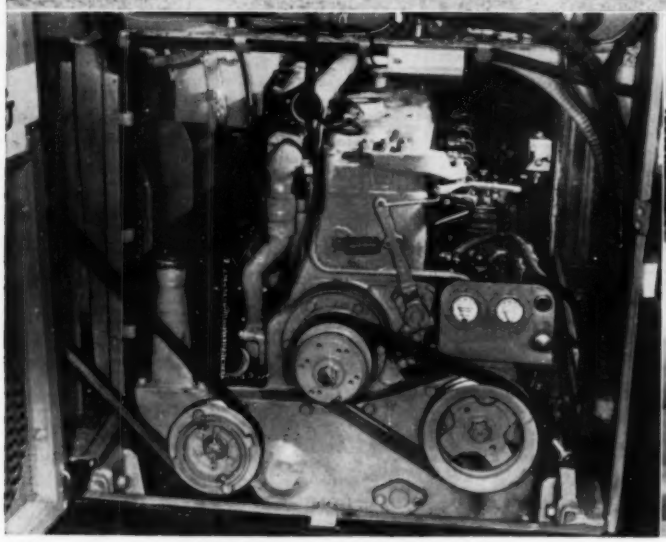
The "Luxury Liner" has a wheelbase of 219.5 inches, overall length of 35 feet, width at the belt of 115 inches, and headroom of 76¾ inches. New "Pillow-back" fully-adjustable reclining seats are 38 inches wide with approximately 36 inches kneeroom. The aisle is 16 inches wide.

The diesel "Luxury Liner" was displayed for the first time at the National Trailways Convention, Dallas, Texas, January 27, 28, and 29. The unit shown will be displayed in the southwest by Peterson Auto Company, Kerrville, Texas, Beck distributors for that area. Eventually it will go into service for the Kerrville Bus Company, San Antonio, Texas.

C. D. Beck and Company also offers a gasoline-powered version of its "Luxury Liner." It also drives through a Fuller Transmission, with a five-speed Model 5-C-65 being used. It is similar to the transmission used in the Cummins-powered model, except that no overdrive ratio is provided.

New *Luxury Liner* intercity bus, built by C. D. Beck and Co., Inc., driven by a Cummins diesel engine.





Recently-introduced 165 hp. Cummins diesel engine is the source of power for the Beck *Luxury Liner*.

The 37-passenger bus is 35 ft. long, has 76¾ in. headroom, and is equipped with 38 in. fully-adjustable seats.

EDUCATION IN DIESEL

Williamsport School Stresses Training in Operation of Diesel Construction Equipment

By SEYMOUR T. BRANTNER

To meet the demand for thoroughly trained operators and mechanics in the Diesel engine field the Williamsport Technical Institute of Williamsport, Pennsylvania, provides a course of study in Diesel Service and another in the Service and Operation of Construction Equipment as a part of the public school system. The Diesel Service students are instructed in all phases of the maintenance and operation of the Diesel Engine and obtain much of their instructional experience by maintaining the engines in the equipment used in the Construction Equipment program. The Diesel students thus have an opportunity to work under actual conditions on this type of equipment as well as other types of installations including marine, stationary and generating sets. The students in Service and Operation of Construction Equipment are instructed in the proper methods of operation of all the modern types of earth moving and construction equipment, and in addition are instructed in the basic fundamentals of the Diesel Engine so that they can be better operators of their equipment. The fact that both of these courses of study are offered in one school as separate courses readily shows that the students in either one have the opportunity of being much better equipped to accept a job in the trade.

Since these two courses of study are each separate and complete within themselves let us now look at the equipment and instruction content in each. The Diesel Service course which is the older was introduced into the curriculum in 1938 to meet the demand for trained operators and mechanics in the Diesel engine field. The growth of this course has been in many ways a parallel of that of the Diesel Engine industry. It originated in the East which means that it was introducing a trade more or less foreign to the area much the same as the engine itself was introduced as a newcomer. It started on a smaller basis than its present size and experienced an amazing growth similar to the industry until at the present time the value of the engines and equipment is approximately $300,000. Similar to the industry the course is still growing with the addition of new testing equipment, engines, and controlling mechanisms. This growth has not been restricted to the physical plant alone but has also been manifest in the number of students enrolled, the course content, and the number of successful graduates placed in the many fields of application of the Diesel Engine.

Vocational education which is basically "learning to do by doing" necessitates that enough equipment be available for learning so that a student can satisfactorily learn to do in a manner that is indicative of the requirements of the trade. This requirement has been adequately met in the selection of types and kinds of engines now installed in the Diesel Shop. The 3000 square feet of floor space is filled with 16 engines all of which are in running condition, testing equipment, and control panels. The engines installed, which are listed below, include four-stroke cycle both naturally aspirated and supercharged, two-stroke cycle, opposed piston, marine, stationary, generating and portable. The following engines are installed:

1–150 hp. 3 cylinder Fairbanks-Morse opposed piston generating type engine with heat exchangers and accessory pumps for cooling water, fuel, oil, and lube oil
2–15 hp. 2 cylinder Superior engines of the generating type with heat exchangers and engine driven pumps
2–225 hp. 6 cylinder General Motors, Gray Marine conversion
2–160 hp. 6 cylinder Murphy engines supercharged generating type with radiator cooling
2–90 hp. 6 cylinder Cummins engines of the generating type with radiator cooling
1–65 hp. 6 cylinder Chrysler engine of the generating type with radiator cooling
1–131 hp. 6 cylinder Mack engine of the truck type
1–35 hp. 4 cylinder Caterpillar engine of the dozer type
1–50 hp. 4 cylinder Caterpillar engine of the industrial type
1–10 hp. 1 cylinder Witte stationary type
1–10 hp. 1 cylinder Fairbanks-Morse of the stationary type
1–5 hp. 1 cylinder Witte stationary type

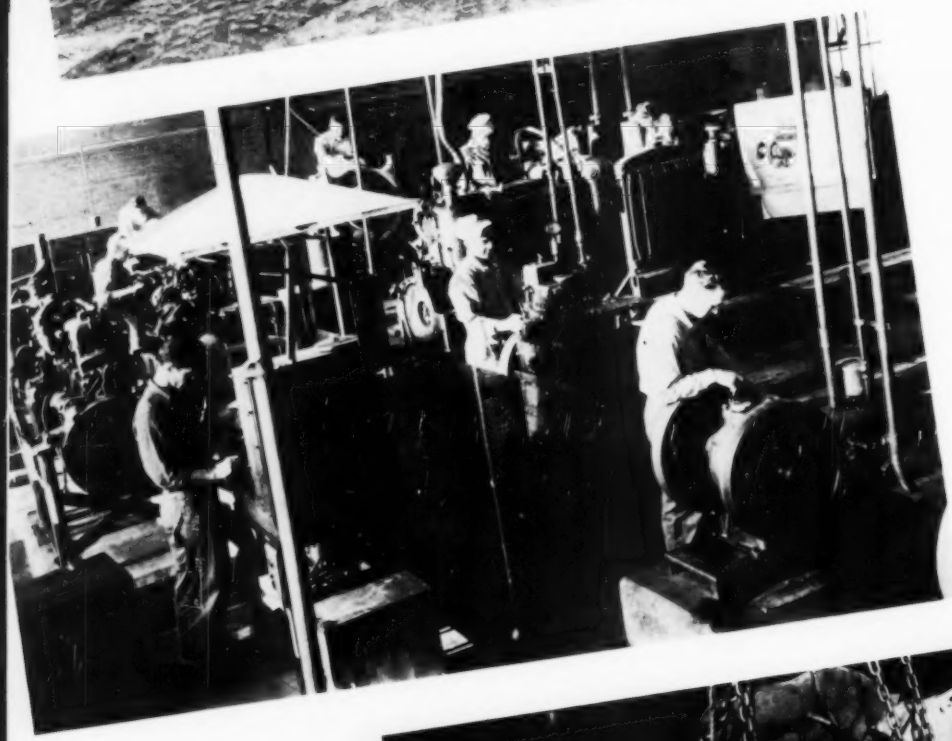
The accessory equipment, instruments, and tools which are a necessary part of intelligent engine work have also been adequately provided by the Williamsport Technical Institute. There are tachometers, strobotac, pyrometers, micrometers, surface gauges, fuel pump calibrators, torque wrenches, and pressure indicators. A water brake is used as a power absorber on one of the engines to duplicate operating conditions, this is in addition to the generating sets with electric controls.

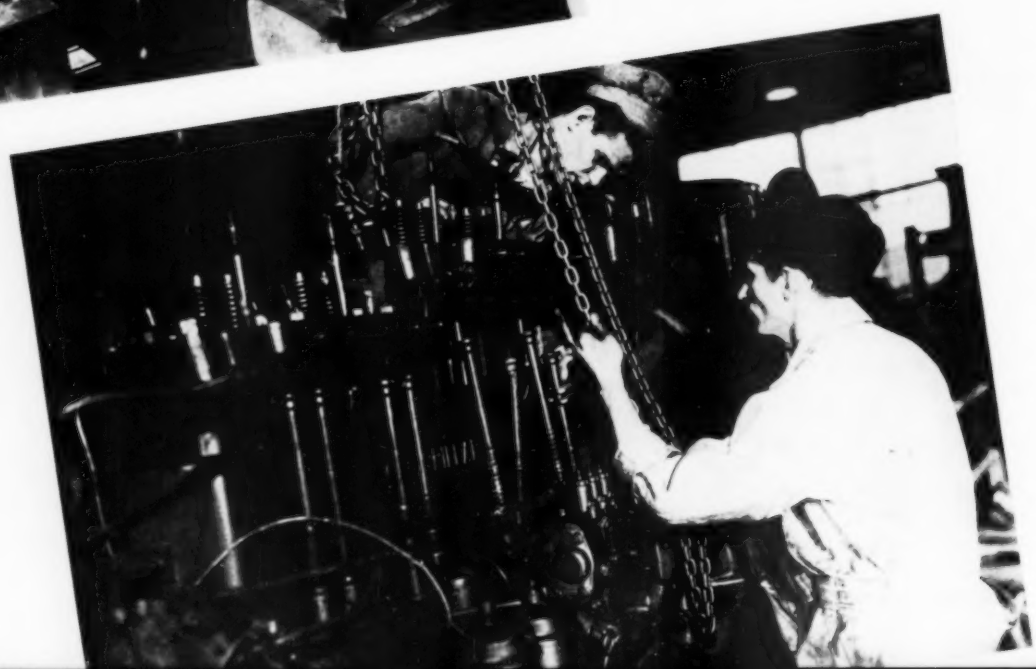
A section of the shop is used as a fuel pump and injection laboratory in which the students learn the operation of these units as well as the construction. There are sufficient pumps and nozzles provided to give the students a working knowledge of practically all fuel pumps and injectors found on modern Diesel Engines. These pumps and injectors are intelligently disassembled, studied, reassembled, and tested; then the learning of the students is checked by the instructor and by actually checking the operation of the unit. This same procedure of making an engine or its accessories operate satisfactorily is an important one of the many checks throughout the entire course.

A portion of each school day is reserved for class room instruction which is a vital part of any organized course of study. During the time spent in the class room demonstrations are given, films are presented, related questions discussed, engine parts and accessories analyzed, correct working procedures emphasized and new developments of the industry studied. A partial list of the subject matter included is:

Four Stroke Cycle Engines	Engine Construction
Two Stroke Cycle Engines	Engine Installations
Opposed Piston Engines	Starting Systems
Fuel Injection Pumps	Fuel Oils, Lube Oils & Purification
Fuel Injection Nozzles	Cooling Systems
Lubrication	Air Compressors
Governors	Operating Procedures
Pumps	Engineering Fundamentals
Transmissions	

The students are also instructed in the basic fun-





(Top view) Caterpillar and Allis Chalmers equipment is used by students developing a community playground while in training.

(Above) View of Diesel shop. Engines installed include, Fairbanks-Morse, Superior, General Motors, Murphy, Cummins, Mack, Caterpillar, and Witte Diesel.

(Right) Diesel students replacing cylinder head on Caterpillar Diesel engine.

damentals of Electricity and Welding. In doing this the aim is not to detract from the Diesel training but rather to better equip the student with more understanding of his job as a good Diesel Serviceman.

The placement in the trades, of graduates from this course of study, is a record of which the school is proud. The graduates have been successful in obtaining jobs in the stationary generating stations, transportation equipment maintenance, construction equipment maintenance, and railroad maintenance field of application. Correspondence from graduates who state that they are now chief operators, or keeping the engines available for use through their work gives ample proof that education does assist in progress in a trade. The school is thus maintaining a standard that will produce graduates that can assist an industry to grow.

The course of study in the Service and Operation of Construction Equipment is the younger of the two but provides adequate training with ample equipment available for this training. This training is designed to prepare intelligent operators for units of construction equipment. In order to do this the students are taught not only operation, but also servicing of the equipment, minor maintenance and operating principles. This preparation is provided with the idea that an operator is a better operator when he knows his machine and the benefits of proper operation. The equipment available for this course of study is again varied and representative of the trade, with a value of approximately $250,000. The students in this course operate the equipment on actual beneficial community and school projects. Their school day is usually far removed from a class room and is spent in an open field, at a city park, or at a prospective community playground. Nevertheless a definite part of their school time is reserved for

class room instruction. This instruction is given primarily during the winter maintenance period or when the elements of nature prohibit operation. The theory studied by students includes:

Principles of the Internal Combustion Engine
Principles of the Diesel Engine
Lube Oils and Lubrication
Rigging and Hitches
Hydraulic Systems
Transmissions and Clutches
Elementary Surveying and Grading
Operating Procedures
Equipment Inspections

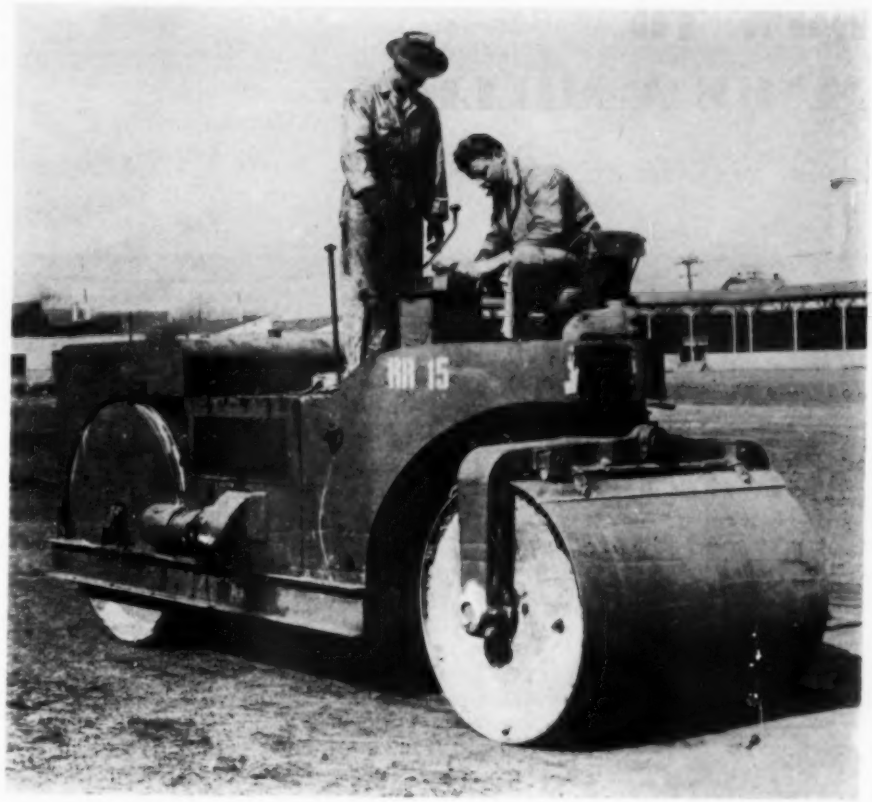
These students are instructed in the basic fundamentals of welding so that they may be as completely trained as possible.

The following units of equipment are available for instruction:

1—Allis-Chalmers HD-7 Dozer
2—Caterpillar D-7 Dozer
1—Caterpillar D-8 Tractor
2—Caterpillar D-4 Dozer
1—Caterpillar D-6 Dozer
3—Caterpillar R-4 Dozer
1—Barber-Greene Ditching Machine
1—Caterpillar D-4 Skip Loader
1—Buffalo Springfield KT-16 Roller
1—Buckeye Model 70 Power Shovel
1—Galion Model 101-D Road Grader
1—Quick Way Truck Crane
1—Le Tourneau Carryall Scraper
1—20 Ton Trailer
1—10 Ton Trailer
1—Clark Fork Lift Tractor
1—Case Farm Tractor

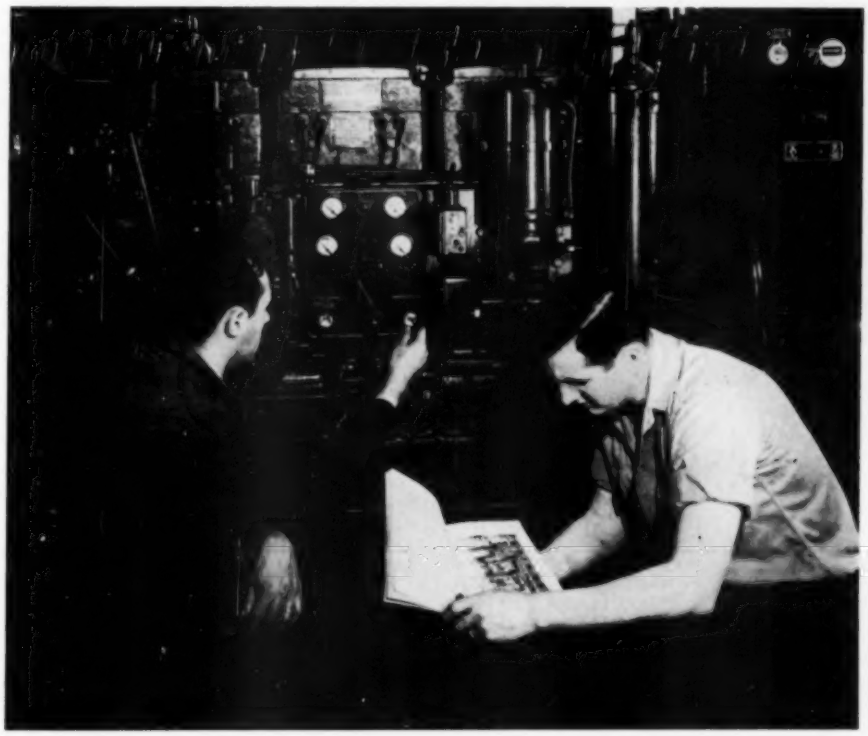
The placement record of graduates from this course of study is very enviable. The graduates have obtained jobs on dike construction stripping operations, excavations and general construction projects. Practically all of the graduates have obtained their own jobs and are successful in them. This fact again proves that education is definitely beneficial to both the individual and industry.

The primary purpose of the school is to educate, therefore, it is necessary to have adequately prepared instructors. This important requirement is adequately provided for by the instructors in these two fields of application. All of the five instructors are qualified by their experience to teach in adult school or high schools in the Commonwealth of Pennsylvania and have qualified or are qualifying for their degree in the Education Field. The instruction is on an individual basis throughout the entire course and monthly interviews with the instructor or department head are conducted with the aim that individual problems and difficulties are solved as they develop. This procedure assures the student of receiving instruction to adequately prepare him for his chosen trade in view of previous experience.



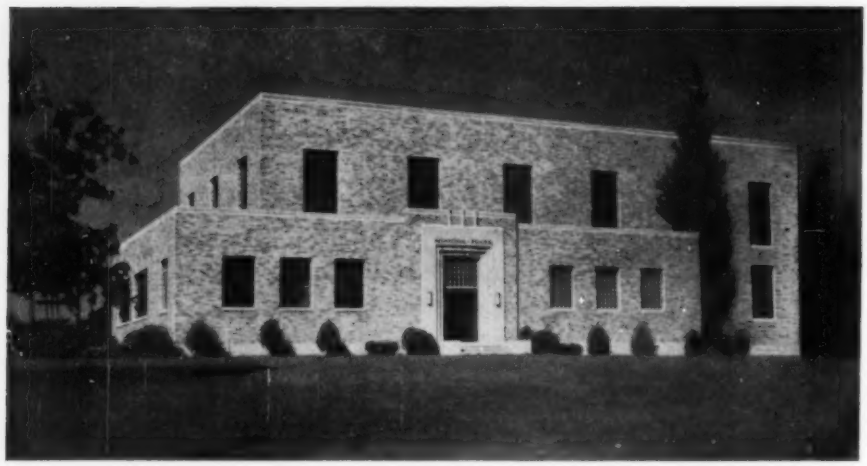
Students checking the effectiveness of maintenance by an operational test on road roller.

Fuel system of Cummins Diesel is checked over by students.



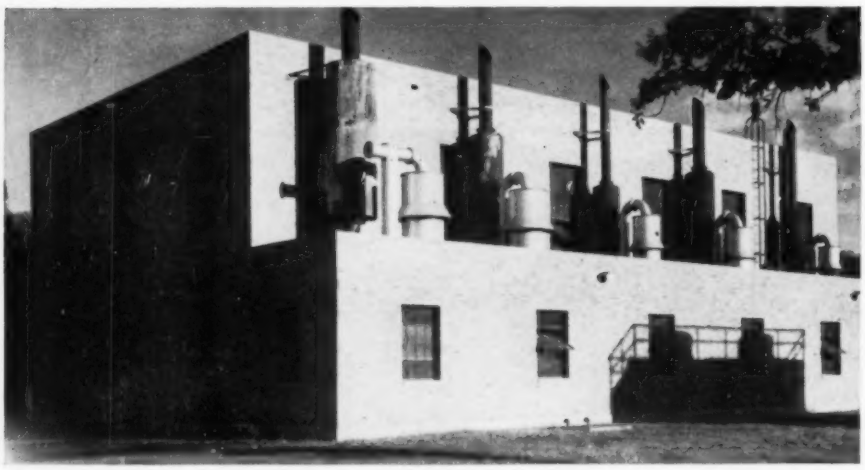
HOW TO MAKE A MILLION

By WILLIAM H. GOTTLIEB



(Above) The Algona plant which, in 20 years, has produced 76,000,000 kwn. at a profit of $1,300,000.

(Below) Exhaust gases vent through Burgess snubbers, Maxim silencer on the new engine, while intake air passes through American cycoil filters.



IN the 20 years since Algona, Iowa, installed the first of the Fulton diesels presently in service, the municipal power plant has produced more than 76,000,000 kilowatt hours at a profit of more than $1,300,000. This has been enough money to pay for the modern $889,000 plant which houses five Fultons totaling 5,600 hp., enough to provide $140,000 in free services to the city, enough to permit donations of $200,000 to the city general fund, enough to provide a cushion of $155,832.04 in cash and government bonds. This is the financial picture of the Algona electric department on March 31, 1948, the end of the latest complete fiscal year. It should be interesting to see how the city achieved this enviable position.

The Algona power story goes back more than 50 years to 1897 in the days of kerosene lamps and hitching posts when a group of prominent citizens constructed a $10,000 steam plant and leased it to the city. The original Corliss engine lasted until 1910. Two oil engines, installed in 1907, gave service until 1917. It was in that year that city authorities turned to diesels in an effort to improve production economy and to obtain longer equipment life. The engine chosen was a slow speed 200 hp. Fulton diesel. A 425 hp. Fulton was addd in 1919 and a 325 hp. Fulton in 1921. The first of these units served 21 years, the second 23 years, the third 21 years; all were removed to make room for larger engines, not because they were worn out. In fact the 200 hp. unit was sold to a sugar mill in Cuba while the other two were sold to the Army and shipped to the Hawaiian islands. To the best of our knowledge, all three are in service today.

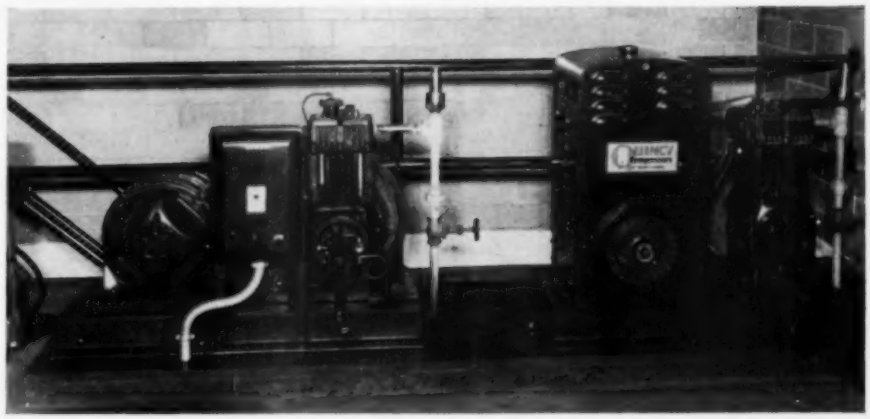
The first of the diesels still serving Algona today is a 6 cylinder air injection Fulton rated at 600 hp. at 200 rpm. Installed in 1928, this engine has run more than 77,000 hours and functions today with approximately the same efficiency it displayed 20 years ago. The next plant addition came in 1931 in the shape of a 5 cylinder air injection Fulton developing 1,000 hp. at 200 rpm. In 1938, an 8 cylinder mechanical injection Fulton rated at 1,000 hp. at 225 rpm. was installed. It was soon recognized that the building housing the diesels had reached the limits of its usefulness and, on the advice of the engineering firm of Burns and McDonnell, a completely new structure was built in 1941 and 1942. The growing load demanded still more power and Algona purchased a 1500 hp.

Generating Costs of the Algona Plant

Fiscal Year Ending March 31	Total Revenue	Supervision and Labor	Fuel	Lube	Supplies and Miscellaneous	Maintenance and Repairs	Total Generating Cost	Total Generating Cost per kwh	Electric Department Expenditure	Depreciation	Net Profit After Depreciation
1940	119,004.42	7,372.89	20,170.57	1,689.47	1,461.25	3,595.40	34,289.58	.0083	50,420.98	20,901.53	47,681.91
1941	125,501.42	8,131.56	21,424.53	1,391.97	1,788.81	2,392.13	35,129.00	.0078	50,467.54	21,133.30	53,900.58
1942	132,343.82	10,341.56	22,784.67	1,674.87	2,909.03	5,104.95	42,815.08	.0088	57,968.05	21,208.55	53,167.22
1943	127,920.21	10,121.97	22,026.92	1,087.56	2,447.80	7,255.68	42,939.93	.0083	57,590.91	25,263.29	45,066.01
1944	114,734.92	11,132.39	22,828.24	824.88	2,022.73	6,161.20	42,969.44	.0082	61,609.81	25,491.32	27,633.79
1945	132,851.89	13,840.79	26,705.33	958.40	2,025.69	4,387.48	47,919.68	.0075	68,790.89	26,616.22	38,444.75
1946	132,198.58	15,502.76	29,372.43	1,352.25	2,212.70	4,918.97	53,359.11	.0078	73,779.34	25,529.55	32,889.69
1947	141,856.91	17,285.95	34,615.56	1,604.00	2,588.86	5,806.58	61,700.95	.0081	83,756.07	25,720.58	32,380.26
1948	158,890.84	18,202.48	54,445.27	2,560.37	3,117.23	5,659.19	83,984.54	.0095	112,193.31	26,284.32	46,413.21
											377,577.45

Fulton mechanical injection diesel, a 6 cylinder unit which develops its rated horsepower at 225 rpm. After this engine had been put to work, the 600 and two 1000 hp. units were moved to the new plant, a move that was accomplished without a single interruption of electric service. Latest addition to the plant is another 1500 hp. 6 cylinder, mechanical-injection, 225 rpm. Fulton diesel, installed in 1947. This last unit drives a 1500 kw. General Electric generator and is arranged so that an exhaust turbo supercharger can be added to bring its horsepower rating to 2200 when more power is required.

From the outset, the Algona plant has been growing. The founding fathers got their $10,000 back out of plant earnings and the plant has never since been in debt. With profits high and a substantial reserve put aside for depreciation, there has always been money on hand to finance necessary expansion. Thus the city has saved the cost of the usual financing. It is noteworthy that on March 31, 1948, after the expenditure of $250,000 for the new building and engine in 1942 and another $150,000 for another engine in 1947, the electric department still had $21,153.49 in cash on hand and $134,678.55 invested in government bonds. In 1928, total kwh. generated were 1,326,975 while production in 1947 was 8,472,600, with 11,000,000 estimated for the calendar year 1948.



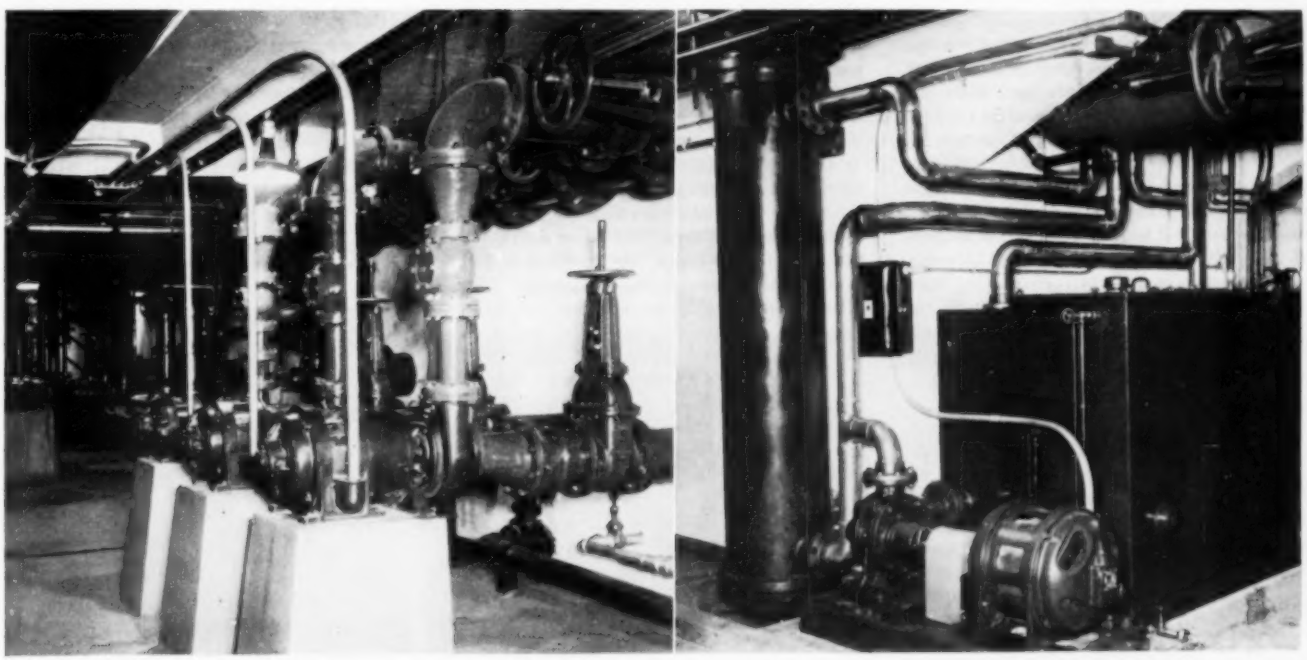
Starting air is supplied by either of these Quincy compressors, one driven by a motor, one driven by gasoline engine.

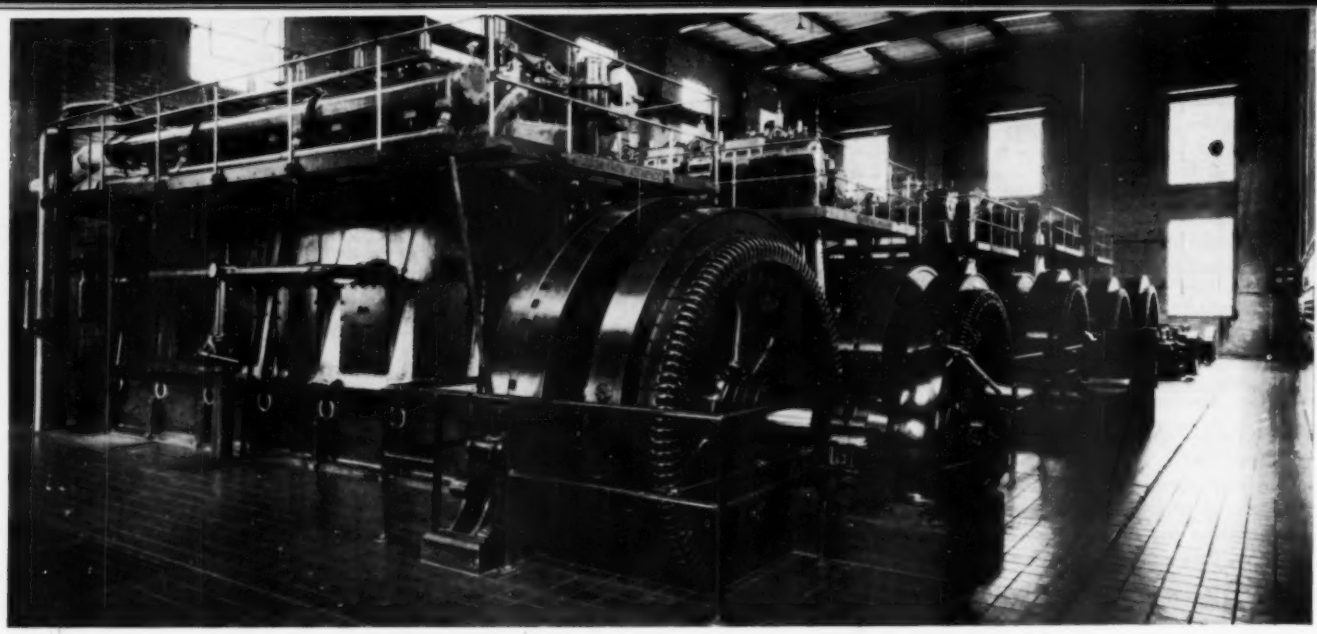
Algona has been able to pile up profits at the same time that it sells electricity to its communal owners at rates substantially lower than those of many comparable cities. The lighting rate is 6 cents per kwh. for the first 50 and 3 cents for the rest, while the water heating rate is just 1.5 cents per kwh. In addition there is a 10 percent discount on all bills paid by the 20th of the month due. As a result, there are 700 electric ranges and

(Above) Four Honan-Crane purifiers are used to keep lubricating oil clean. All purifiers operate 24 hours a day.

(Below left) Three motor-driven Ingersoll-Rand centrifugal pumps circulate soft cooling water.

(Below) Lube for each engine is circulated from a sump tank and each engine has an oil cooler (Ross for the new engine).





The five Fulton diesels at the Algona plant totaling 5600 h.p. Latest addition is a 1500 hp. diesel installed in 1947.

600 electric water heaters in this community of about 7,000 population.

When rates are moderate and profits high, the only possible answer is economical power production. From the first, Algona engineers decided upon long-wearing, heavy-duty diesels that would maintain operating efficiency over a long period of years. Even in recent years, they resisted the temptation to save on initial cost by purchasing higher speed engines and the fastest unit in the plant rotates at a deliberate 225 rpm. Naturally, the old air-injection engines do not match the high efficiency of the new mechanical injection units, but even the oldsters are giving a good account of themselves. According to Superintendent C. U. Pollard and Chief Engineer F. C. Dailey, the 600 hp. engine produces 10.75 kwh. per gallon of fuel while the 1000 hp. air injection engine returns 11 kwh. per gallon. The 1000 hp. mechanical injection diesel gives an average of 13.7 to 13.9 kwh. per gallon of fuel while the 1500 hp. engines average a superlative 14.4 to 14.5 kwh. per gallon. Average load is 65 percent.

This high degree of efficiency is of particular importance in this inflationary period when expenditures for both fuel and labor are far above levels of just a few years ago. Even in 1948, Algona's total generating cost per kwh. was just 9.5 mils. Table I gives a good picture of operating costs for the last nine fiscal years. The table gives total revenue, supervision and labor, fuel, lube, supplies and miscellaneous, maintenance and repair, total generating cost, total expenditures of the electric department (including distribution, sales, etc.), reserve for depreciation, and net profit after depreciation. In calculating maintenance costs, Algona includes pro rata wages of superintendent and operators for time spent on maintenance jobs. Since the engines had to be dismantled completely for the move to the new building, the occasion was taken to do a thorough overhaul job on each unit. It will be noted that net profit for the nine years, after depreciation, was a tidy $377,577.45.

One of the reasons for the low production cost has been the success of the plant in burning a southwest Texas crude oil of about 24 gravity supplied by the Diesel Service Co. at a delivered price (at this writing) of 11 cents a gallon. This, of course, is considerably more than Algona paid when it started using the fuel years ago, but it is substantially lower than the price of most alternate diesel oils. Algona has large fuel shortage capacity and purchases the oil in tank car lots for storage in any of five tanks: two 30,000 gal. underground concrete tanks, two 18,000 gal. steel tanks above ground, and a 45,000 gal. converted water tower. Having five tanks, it is possible to allow a period for impurities to settle out and simple mechanical filtration (a Cuno Auto-Klean on the newest engine) is all the treatment required. From storage, the fuel is pumped through meters (Bowser on the new engine) to individual 300 gal. day tanks in th plant basement by float-controlled Viking pumps. Both the air and mechanical injection units consume the crude oil without difficulty of any kind. The success of the operation is measured by the fuel consumption averages cited above.

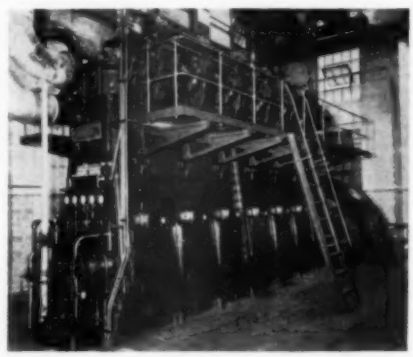
Lubrication problems receive careful attention in this plant. Socony-Vacuum's Vacme 3 is used in all crankcases, DTE 3 for cylinders on the 600 hp. and mechanical injection 1000 hp. engines, and DTE 4 on cylinders of the other units. Four Honan-Crane activated clay reclaimers are used to keep lube in condition, one for the two oldest engines, and one each for the other three diesels. The reclaimers are operated 24 hours a day, regardless of whether the engines served are running. It is felt that this procedure is best calculated to condition the oil and remove impurities from the lube. Manzel lubricators service the cylinders on all engines. The two 1500 hp. units and the 1000 hp. air injection engine have their pistons cooled by lubricating oil. All engines have lube coolers (Ross on the new engine.) Lubrication results have been highly satisfactory. There have been no stuck rings and no observable carbon deposits on the pistons. Wear has been small, so that original tool marks were still visible on the cylinder liners of the first 1500 hp. unit after more than 30,000 hours of operation.

Cooling water treated in a Culligan Zeolite softener is circulated by three motor driven Ingersoll-Rand centrifugal pumps through engine jackets and coils of a Marley forced draft cooling tower.

Air for the engines is drawn through American Cycloil oil bath filters mounted high on the outside of the plant. Exhaust gases vent through Burgess snubbers except for the newest engine which has a Maxim silencer. Starting air is provided by two Quincy air compressors, one driven by a gasoline engine, the other by a 10 hp. Westinghouse motor.

Further operating aids and insurance against damage to the power equipment are provided by a five panel alarm and auxiliary control board which holds, among other things, three Brown exhaust pyrometers and a Brown full Throttlor for the new engine. The 13-panel all-enclosed switchboard has a full complement of Westinghouse instruments.

This 1500 hp. Fulton diesel is designed to permit addition of a supercharger which would bring capacity to 2200 hp.



NEW TURBOCHARGER PLANT

Elliott Company, builder of turbochargers used in connection with the Buchi system of turbocharging American manufactured four-cycle diesel engines, has completed a new building to meet turbocharger production requirements.

From 1934 (when the first American turbocharged diesel engines were equipped with Swiss turbochargers) to 1940, the Buchi system of turbocharging 4-cycle diesel engines has received increasing acceptance in the United States. To satisfy this demand, Elliott Company in 1940 acquired the patent rights to build Buchi turbochargers for marine, stationary, and locomotive diesels. Since then, orders for turbochargers have increased to such proportions that Elliott Company has found it necessary to expand turbocharger manufacturing facilities. Production of Elliott-Buchi turbochargers has been more than doubled with the completion of the new plant.

The new plant, completed in March and put into operation in May, 1948, is of the latest design. Dimensions are 150 ft by 200 ft, or an area of 30,000 sq ft. More than 150 workers are employed in the building which has a compact equipment layout, an orderly production flow system, mechanized materials handling techniques, overhead-mounted utility service facilities, and an up-to-date type of ventilation, all contributing towards a comfortable working environment for its employees.

The building, constructed of steel with a brick curtain wall eight inches thick, has a surface-hardened concrete floor. Factory-type, obscure glass, 17 ft in height extends around approximately two-thirds of the plant. This special feature permits the entrance of natural light without glare. Roof construction is of poured gypsum over steel sub-purlins. At the north-west corner a 9 ft by 18 ft annealing furnace is located for the initial preparation of tourbocharger castings. Six double-slide, steel doors are properly situated throughout the building for easy and quick movement of materials and completed equipment. At the north end of the building is a concrete ramp for use by jeeps and trucks. Just installed is a 1,000-sq ft condenser and a 1,000-gpm cooling tower to condense the large volume of steam used in turbocharger testing.

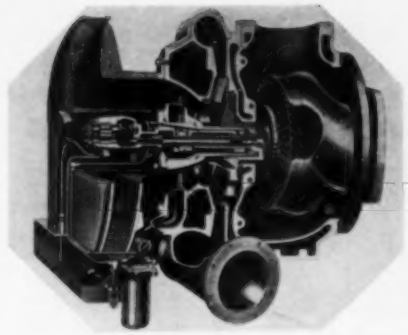
Within less than a year after the 200-ft turbocharger building has been completed, an 80-ft extension is now under way. This additional 12,000-sq ft will have facilities identical to those of the previous construction. It will provide space for a gear hobbing department, an enlarged test floor, and a much needed storage area.

The Elliott-Buchi turbocharger, applied to 4-cycle diesel engines, is a self-contained unit composed of a gas turbine and a centrifugal blower, mounted on a common shaft. The turbocharger utilizes a part of the energy in the exhaust gas, otherwise wasted, to drive a centrifugal blower. This blower supplies all the air, at low pressure, required by the engine cylinders. The low-pressure aid delivered by the turbocharger scavenges the combustion space of the residual gas otherwise left at the end of the exhaust stroke, replacing it with cooler, fresh air. It also fills the cylinder with an air charge of greater density. This gives increased engine outputs of 50 percent and greater.

The heart of the turbocharger is the rotor which revolves at speeds up to 21,000 rpm, and at temperatures up to 1020 F. Even at this speed and temperature, some of the allowable rotating clearances are only .0025 inches. Considering that the rotor tip speed may reach 600 miles per hour, this means that the workmanship and the materials must be of the finest quality for sustained periods of operation.

Let us follow the construction of an Elliott-Buchi turbocharger from its beginning at the north end of the plant. Here the inlet casing, back plate, and turbine and blower casings are annealed. Then, after roto-blasting, they are ready for the various machining operations (vertical turret lathe, Ingersoll, drill press, and Libby lathe). Next, the water-cooled casings are cleaned and pressure tested. Casings are then inspected after which they are ready for assembly.

Several sub-assemblies combine to make up the turbocharger, as shown in the cut-away view. One sub-assembly is the rotor, basically comprising a bladed turbine disk, impeller and shaft. The disk assembly is made up of an austenitic steel disk and buckets. The buckets are vapor blasted and



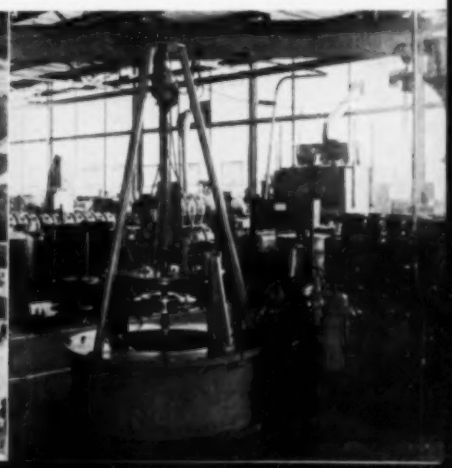
Cutaway view of Elliott-Buchi turbocharger.

damped against vibration with a tangential lashing wire. As a completely finished aluminum casting, the impeller is proof spin tested in a vacuum overspeed pit. It is also given the "Alrok" process which is a chemical treatment providing a protective coating against corrosion. Another sub-assembly is the bearing support assembly consisting of a machined casting, oil baffle, inner and outer bearings, and miscellaneous parts.

The general assembly of the turbocharger begins with the placing of the rotor assembly in the back plate. Next, the bearing support assembly and diffuser ring are placed in the blower casing. Then the back plate and rotor assembly are affixed to the blower casing and bearing support assembly. After this, the blower casing and back plate assembly are fastened to the turbine casing. Next, the nozzle ring is bolted onto the inlet casing which is inserted in the turbine casing. The next to last operation is the installation of the water and the air seal piping. The last operation is the assembly of the lubrication system of which two types are available; one type being a self-contained lubricating system consisting of an oil pump, oil tank, filter, and necessary piping, while the other is an engine-lubricated system embodying a bearing support cap and shield pipe assembly. Several different types of air filters and silencers are available for attachment to the air inlet. The turbocharger then goes to the test stand. Here it is given final performance tests to see that the turbocharger operates satisfactorily both mechanically and aerodynamically. Upon successful completion of tests, the turbocharger moves to the paint booth after which it is prepared for shipment.

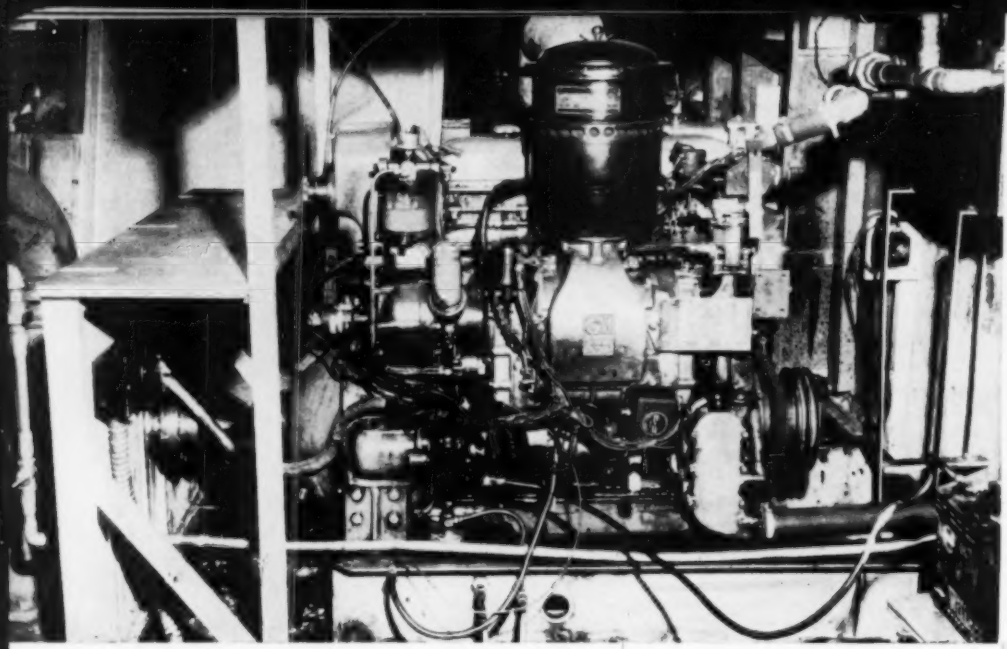
Elliott Company's Jeannette, Pa., plant. Turbocharger building is located in center foreground.

Specially built spinning pit where all turbochargers are over speeded.



AUTOMATIC DIESEL PUMP

By ALFRED A. DECICCO



General Motors 110 hp. at 1300 rpm. diesel engine equipped with Synchro-Start automatic controls.

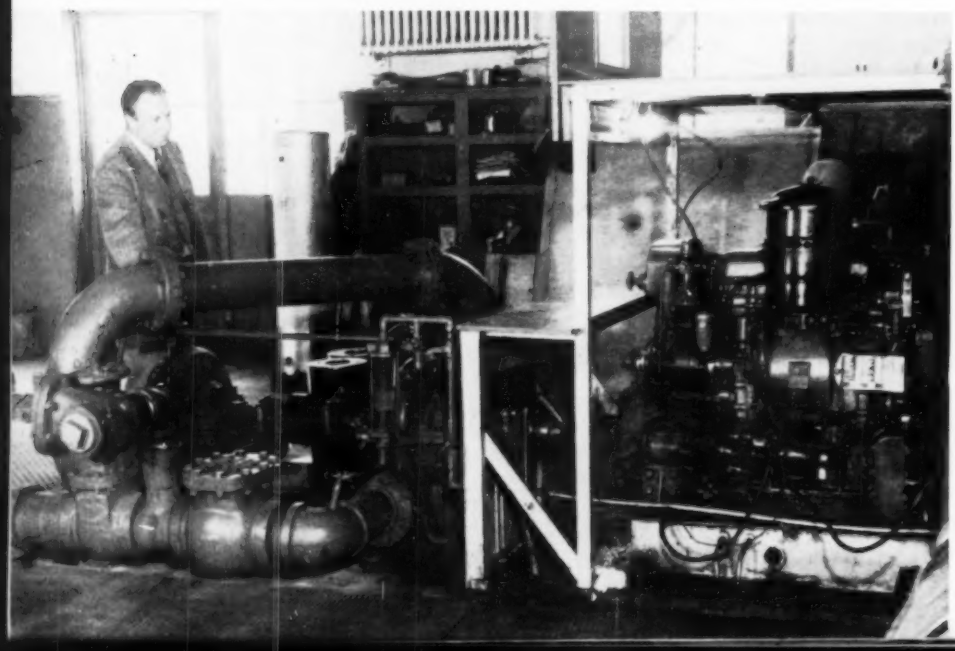
Mr. Alvin Hutchinson reading the water level chart which is hooked up to the Synchro-Start automatic control box.

THE faith and belief a man has in his own ideas turns them into reality if he disregards all opposition—this is the case of Alvin "Hutch" Hutchinson of Oyster Bay, New York. A man that has definitely turned an idea into reality by installing the first Synchro-Start diesel pump in the water works of his community.

The problem of Oyster Bay's Water Commissioner's Edward Chesire, Sam L. Mangam, and Fred C. Valentine and their consulting engineer Fred J. Biele, was to provide a new pump to deliver water the distance of a mile to the standpipe 240 feet high on the top of Capitol Heights. This new pump had been specified by the Water Commission to be electric starting, but on the suggestion of Alvin Hutchinson to install automatic starting and stopping equipment on the new pump, will be a considerable saving for the people of Oyster Bay. Given the permission, but greatly doubted, Mr. Hutchinson proceeded to purchase a General Motors diesel engine rated at 110 hp. at 1300 rpm. equipped with Synchro-Start automatic controls and a two-stage Gardner-Denver centrifugal pump. After installation, this revolutionary unit worked perfectly, and continued smooth operation supplying 7500 people of Oyster Bay with water constantly.

This diesel driven pump easily delivers 800 gallons a minute from the wells to the standpipe and can produce more if need be. Operation of the Synchro-Start automatic engine controls is interesting. Two mercury swtiches, when both in contact, activate a solenoid switch on the diesel unit, thereby starting the engine. After starting, and the diesel engine reaches a predetermined speed, a certain frequency in the coil throws out the solenoid and the engine picks up the governor. One mercury switch holds the diesel in operation until the water in the tank reaches a designated height, then it shuts off. There are relays to the control box for engine over heating, oil pressure and overspeed.

The General Motors 110 hp. diesel engine driving a two-stage Gardner-Denver centrifugal pump.



It had been expected that this new pump would merely be an emergency substitute for the town's 500 gallon per minute pumps, and it would spell them for three hours a night to allow automatic filling of the standpipe during those hours. But the Synchro-Start and diesel operation has proved so cheap and dependable that Mr. Hutchinson's installation is running at an average of fourteen hours a day.

This automatic control proved highly valuable in the dry, mid summer months of July and August when 800,000 gallons of water a month are used. Under the old system where an engineer restarted the non-automatic pumps whenever it was presumed that the level in the standpipe might be low, the result was that the houses high on the slopes had no water pressure whatsoever. But with this automatic starting whenever the water in the tank drops below ten feet, there is constant pressure at all times, eliminating any shortage, and a saving of $2.00 an hour to the people of Oyster Bay whose usable water supply is 20,000 gallons.

DIESELS FOR RICE IRRIGATION

By WILL H. FULLERTON

The new 130 hp General Motors Diesel pumps 3000 gpm. It is industrial type, radiator cooled, portable; easily moved to the other pumping station at the bayou.

View of part of the rice fields on the Lawson farm, near Crowley, La. Water is pumped into a series of canals fitted with gates so that any required field can be flooded.

IN these days of concentrated, production-line farming, when in the production of many crops the acreage is tremendous and measured by the square mile rather than by the acre, it is easy to comprehend the use of big diesels for the development and use of huge tracts of land. Some of the south's rice projects measure their horsepower by the thousands and their pumping plant engine installations are something to dream about.

Yet there is more to this business of diesel engines on the farms than readily meets the eye. Not all farms are big ones; not all irrigation is done by big development and irrigation companies. In fact, the number of comparatively small farms handling their own irrigation is considerable, with this number increasing steadily as small diesels become available, along with fairly well trained men to operate and maintain them.

Let's consider southwest Louisiana, for instance. Rice is a major crop; just as soon as you pass the rich sugar cane belt along Bayou Teche, the rice fields begin and continue well into Texas. As other articles in this magazine have shown, much rice irrigation is big business and highly organized and engineered, but there are many farmers like L. B. Lawson whose farm is near Crowley, Louisiana, and whose total acreage is 1230 of which only 450 acres is in rice.

Lawson's farm is irrigated entirely by one well, plus the pumping of some water from a neighboring bayou. The well is called a 10-inch well, but this is because of the old system of measuring pipe from outside dimensions and the real diameter is around 9 inches. For rice culture, it is essential to keep the soil wet constantly, and since the turn of the century the operators of this particular farm have used some kind of power.

The first rig was a steam one. In 1920 or thereabouts, the steam engine was discarded and a 90 hp. semi-diesel installed. This engine was a mammoth; with only one cylinder, the total weight was close to ten tons. The foundation alone cost one third as much as the entire new power plant now irrigating the Lawson farm.

This new engine is one of the modern jobs, a portable 6-cylinder General Motors, 71 series, needing no foundation at all. When Mr. Lawson wishes to use the water of Bayou Plaquemines-Brulee, he simply removes the belt from his well-pump and moves his engine over to the bayou; here there is another pump and another old-time mammoth of a one-lunger. This new General Motors, therefore, replaces not only one former power plant but two, at a saving of initial investment which is considerable. Operation is cheaper, too; the old outfits were a bit on the cranky side and it was a good idea to have an attendant in the vicinity if you wanted any water. With the new diesel, somebody has to start it and that's all. This engine pulls 3000 gallons of water per minute from the well, much more than the old engine would lift; the power for this load simply wasn't there. And as for cost of running the new machine, Mr. Lawson estimates it at $1.00 per hour, which includes fuel, lube and depreciation of the engine. Good fuel is used, Magnolia, at a cost of 10c per gallon. Lube oil is RPM.

The diesel is rated at 130 hp. at 1600 rpm., for continuous operation. Fuel consumption at this load averages 8 gallons per hour. Engine equipment is standard as supplied by the factory; fuel filters are AC, and the operators change the filter unit at every oil change; lube filters are also AC. Fuel injection is the exclusive General Motors system, using 60 mm injectors on this model. Starting is electric, using Exide batteries. Cooling is by radiator, and nothing but clean rain water is ever put into the radiator. The diesel never heats, says Mr. Lawson, and he never has to add any water to the cooling system.

The installation was made in May, 1946; two full seasons of pumping are to its credit already, and not a cent's worth of repairing or service has been required other than a little minor adjusting of the valve tappets and the governor. 5,000 barrels of rice a year are produced on this farm with the aid of this one diesel which is doing more work and doing it at less expense than the two old-fashioned engines which it replaced.

"That's good service," comments Mr. Lawson; "just use clean fuel and clean lube oil, and remember to change your filter elements, and a General Motors diesel will do a lot of work."

Mr. Lawson, together with his brother, also operates another farm with a General Motors 6-71 pulling the irrigating pumps. That engine also is a definite success; it has already enabled the farmers to make seven crops.

As to the well pump, it is a Layne #7, 2-stage, with closed impellers; a centrifugal. The drive belt is flat, 12 inches in width; "Neoprene" brand, its total length is 50 feet, and less.

The engine was supplied by the firm of Cart-DuBus, of Crowley, a dealer served by the George Engine Co., New Orleans distributors of General Motors diesels.

ASME 1949 Oil and Gas Power Conference to Discuss Diesel Progress

Hotel Sherman, Chicago, Ill., April 25-29

THE 1949 Oil and Gas Power Conference sponsored by the Oil and Gas Power Division of The American Society of Mechanical Engineers in cooperation with the ASME Railroad Division and the ASME Chicago Section, will be held at the Hotel Sherman, Chicago, Ill., April 25-29, 1949.

In addition to the technical program the conference will feature a special preconference lecture program for which special registration will be required, an exhibit of Diesel engines, accessories, and instruments, and inspection trips to the local Diesel plants.

Registration fee for the conference will be $2.50 to members and $5 to nonmembers. Registration for one day will be $1.25 and $2.50, respectively. Preprints will be free to those paying full registration fee.

Lecture Program

The preconference lecture course to be given on Monday, April 25, will consist of three lectures on the subject, "Gaseous Fluid Flow in Relation to Diesel and Internal-Combustion-Engine Design." Registration for the course is $12 for ASME members and $15 for nonmembers, payable in advance to John C. Gibb, Room 1323, Socony-Vacuum Oil Company, Inc., 26 Broadway, New York 4, N. Y. Those wishing to attend the lectures are urged to write Mr. Gibb without delay.

The lecture program follows:

MONDAY, APRIL 25

9:30 a.m.

Cooling of Internal-Combustion Engines, by B. Pinkel, Lewis Flight Propulsion Laboratory, National Advisory Committee for Aeronautics, Cleveland, Ohio.

12:15 p.m.

Luncheon; during which John T. Rettaliata, Mem. ASME, dean, school of mechanical engineering, Illinois Institute of Technology, Chicago, Ill., will comment on the lectures.

2:30 p.m.

Fundamentals of Air Flow in Diesel-Engine Manifolds, by W. W. Hagerty and L. Talbot, professors, University of Michigan, Ann Arbor, Mich.

7:30 p.m.

Reduction of Noise in Engines, by W. P. Green, professor, Illinois Institute of Technology, Chicago, Ill.

Diesel Engine Exhibit

The 1949 Diesel engine exhibit promises to be a larger attraction than ever before because of the excellent facilities at the Hotel Sherman for handling and exhibiting large pieces of equipment. Recognizing the educational value of technical exhibits, the conference program was planned to give members ample time to inspect the latest equipment in the Diesel power field.

Of interest to all engineers in the oil and gas-power field will be the organization meeting of the Oil and Gas Power Division's General Technical Committee which will be held on Tuesday evening, April 26. The meeting, to which all members and guests are invited, will explore how the Oil and Gas Power Division can best serve the technical interests of the oil and gas-power field.

Technical Sessions

Registration for the conference will begin at 6:00 p.m. on Monday, April 25. The first technical session will meet the next afternoon, following a general luncheon at which members and guests will be welcomed by officers of the ASME Oil and Gas Power Division, Railroad Division, and the Chicago Section. The tentative technical program follows:

TUESDAY, APRIL 26

12:15 p.m.

Welcoming Luncheon

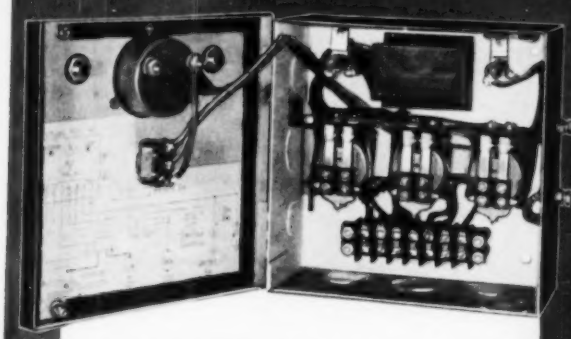
2:00 p.m.

Session I

Dynamic Analysis of Valve Springs, by Troels Warming, assistant professor of mechanical engineering, University of Wisconsin, Milwaukee Extension, Milwaukee, Wis.

THE NEW RC SERIES

CONTROL SETS



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This control contains most of the desirable features of the famous Synchro-Start Model 1436, yet is priced so low even the user of the smaller engines cannot afford to be without it.

Nothing is sacrificed in regard to reliability or dependability. Over seventeen years of experience in building the world's finest engine controls is behind this unit.

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- Cut-out of starting motor after engine starts by build-up of battery charging generator voltage.
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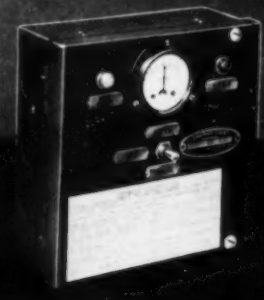
- Battery charging ammeter (optional).



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Vibrations in Valve Mechanism, by Troels Warming

Effects of Cylinder Pressure Rise on Engine Vibrations, by J. O. Hinze, "Delft" Laboratory, Royal Dutch Shell, Holland.

8:00 p.m.
General Technical Committee Meeting
All members and guests interested in the oil and gas-power field are invited to participate.

WEDNESDAY, APRIL 27

9:00 a.m.
Session II

Two-Cycle Dual-Fuel Diesel Engine With Automatic Fuel Conversion, by E. L. Conn, R. H. Beadle, and G. A. Schauer, research staff of Fairbanks, Morse and Company, Beloit, Wis.

Diesel Locomotive Engine Cooling System, by F. H. Brehob, Locomotive Engineering Division, General Electric Company, Erie, Pa.

Ignition System for Oil Engines, by H. B. Holthouse, Holthouse Laboratory, Chicago, Ill.

1:30 p.m.
Inspection trip to new Diesel Locomotive Repair Shops of Chicago and North Western Railway

7:00 p.m.
Informal Banquet
Toastmaster: R. H. Morse, Jr., vice-president in charge of all operations, Fairbanks, Morse and Company, Chicago, Ill.
Speaker: R. B. McColl, president, American Locomotive Company, New York, N. Y.

THURSDAY, APRIL 28

9:00 a.m.
Session III

A Training Program for Railroad Personnel, by George Y. Taylor, supervisor, education department, locomotive division, American Locomotive Company, Schenectady, N. Y.

Diesel-Engine Maintenance Instruction, Alco V Type Engine, by S. E. Lodge, education department, locomotive division, American Locomotive Company, Schenectady, N. Y.

1:15 p.m.
Inspection trip to La Grange Plant of Electro-Motive Company.

2:00 p.m.
Inspection trip to submarine containing four 1600-hp Fairbanks, Morse Diesel engines.

FRIDAY, APRIL 29

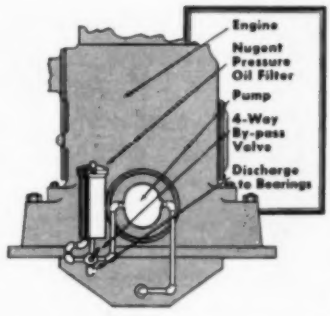
All-day trip by train to the shops of Fairbanks, More and Company, Beloit, Wis.

Order Your Copy of the 1948 DIESEL ENGINE CATALOG, Vol. 13 now. Thoroughly revised — more complete — indispensable. Convenient order coupon on page 80 this issue. Mail it today.

NUGENT large-capacity filters

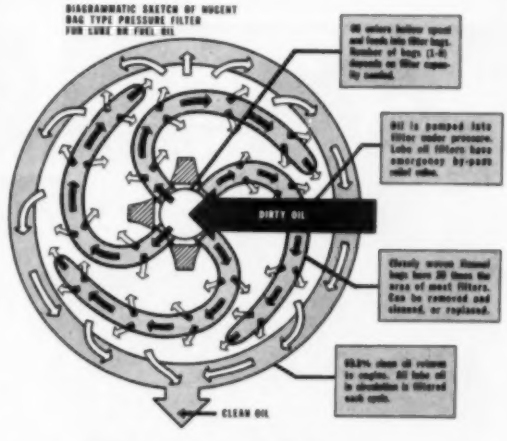
. . . for full-flow filtering clean *all* the oil in circulation every cycle—no *by-passing*

Nugent bag-type lube and fuel oil filters with expendable bags have 20 times more filtering area than other filters of comparable size. Using a Nugent filter, you'll be able to clean *more* oil per hour, with *fewer* changes of filter elements. This is particularly important in full-flow systems, where all the oil in circulation each cycle is being cleaned.



The illustration at the left shows a Nugent full-flow filtering system. Note that the oil is handled by the engine oil pump—no other pump is needed. Filtering systems of this kind are ready for power equipment of any size. Ask a Nugent engineer to give you full details.

The diagrammatic view below shows the tremendous filtering surface of a single bag-type pressure filter. The bag, designed to be used and discarded, is made of a closely woven lintless material which removes particles as small as a few microns and delivers oil 99.8 per cent clean. This type of filter is ideal for filtering all the lube oil in circulation every cycle before the oil goes to the bearings, thereby removing the dirt as soon as it gets in the oil, and retarding the formation of sludge and acidity. The dirt-filled bags are easily removed without tools, and are inexpensively replaced.



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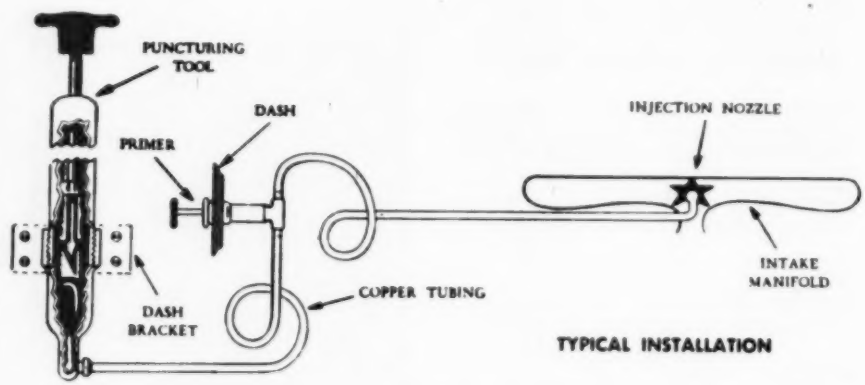
Chevron Starting Fluid

WIDESPREAD use of diesel and gasoline powered equipment in cold climates has increased the need for a safe and economical means of starting these engines at extremely low temperatures. Heretofore lost stand-by time for men and equipment has cost industry approximately $50,000,000 annualy. By use of a special patented quick-starting device, the California Oil Company states that cold weather starting difficulties with diesel and gasoline powered engines have been overcome. Like so many wartime discoveries developed by oil companies, Chexron Starting Fluid is a product of the California Research Corporation. Its present method of packaging and application was developed by the California Oil Company. Both of these companies are wholly-owned subsidiaries of the Standard Oil Company of California. Basically an ethyl-ether compound, its use has been simplified by packing the fluid in gelatine capsules. These capsules come in two sizes, 17 cc. and 5 cc. The capsules are used with a special puncturing tool and priming system, injecting the fluid into the intake manifold. Packaging the fluid in easy-to-use capsules insures safe handling. The fluid flows at 70 degrees (F) below zero. Additives in the starting fluid lubricate as the engine is started. The fluid will not corrode metal parts.

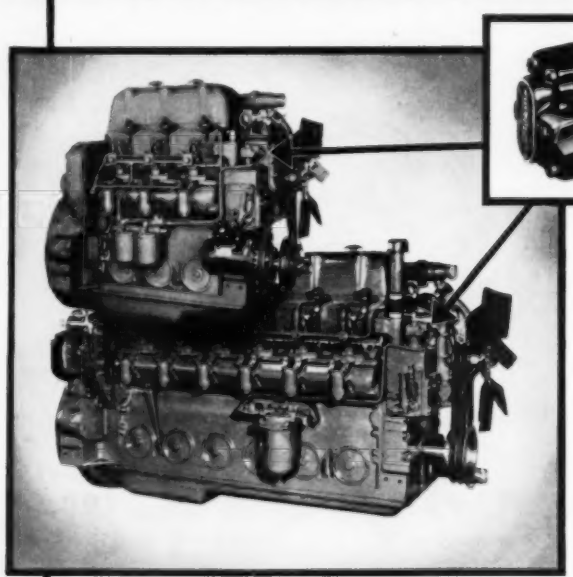
The new priming system for Chevron Starting Fluid has been shown to all leading diesel engine and heavy-road machinery manufacturers in the United States. They have enthusiastically endorsed this method of cold engine starting. As certain cold room and field tests are concluded, it is anticipated that there will be many diesel engine manufacturers who will use this unique and outstanding cold-weather starting device in their production.

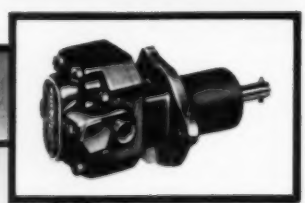
To meet low temperature starting requirements, wartime research by company engineers developed Chevron Starting Fluid to expedite wartime operations in Alaska. The sultant product is so effective that it has started diesel engines in less than 10 seconds at 50 degrees (F) below zero.



TYPICAL INSTALLATION

John S. BARNES





Above, Model GCH BARNES Constant-flo Pump used as transfer pump on P&H Diesel Power Units of the Diesel Division, Harnischfeger Corporation, Port Washington, Wis.

Left, P&H Models 387-C and 687-C two-cycle Diesel Engines which employ Barnes Constant-flo Pumps for fuel transfer.

Constant-flo ROTARY GEAR PUMPS

PROVED IDEAL for DIESEL TRANSFER PUMP SERVICE

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Compact, Efficient, HIGH QUALITY, Long-Life Oil Pumps

ONE OF MANY TOWBOAT INSTALLATIONS WITH ENGINES REGULATED BY

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Sperry Direct-Reading Loran

. . . . . *Continued from page 43* . . . . .

space is limited since the unit can be mounted on a table, shelf, against the bulkhead, or on the deck —and the trunnion mounting permits tilting the control panel to suit the operator.

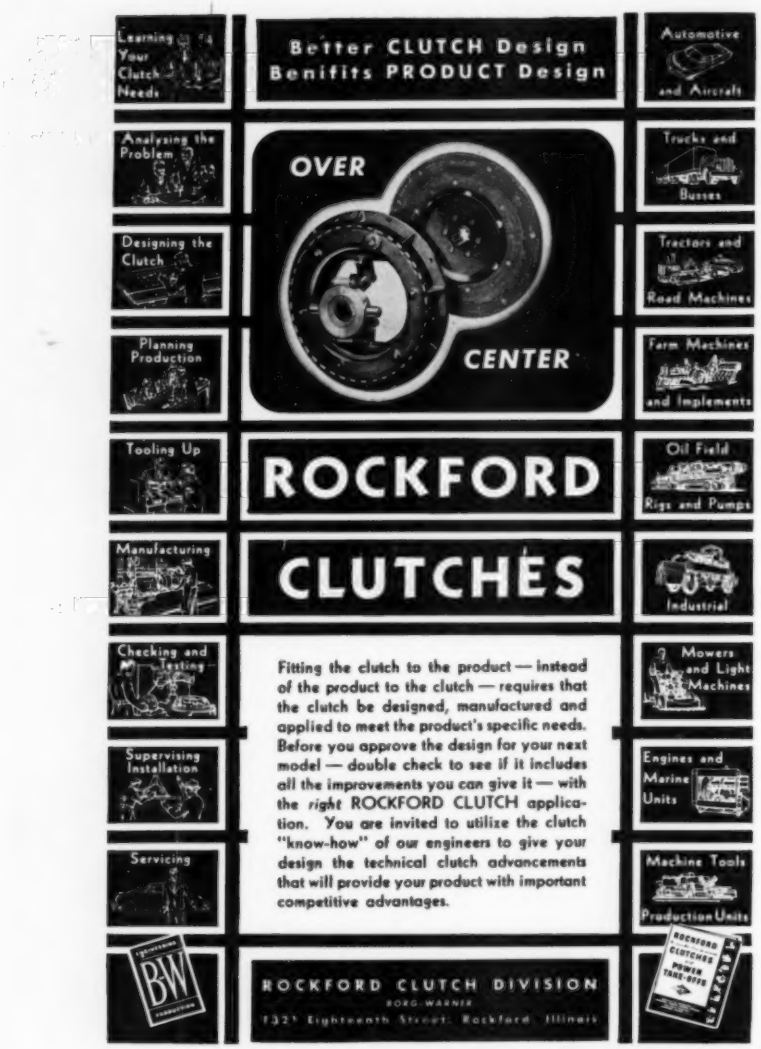
The operation has been simplified through circuit improvements and made faster by means of a motor-driven mechanism. The numbers and characters on the control panel can be easily read in the dark through the use of ultra-violet "black light" which does not interfere wtih night vision. Vessels of various types using the post-war Mark 1 Loran include those carrying flags of the United Kingdom, Sweden, Norway, Canada, and the Netherlands. The U. S. Coast Guard has found Loran invaluable in keeping their weather ships on station. The Sperry Loran receivers are simple to operate and are proving very popular with fishermen as it helps them locate and remain on the best fishing grounds. Installations include 13 fishing vessels in Boston, Gloucester, and Seattle.

Indications of increasing confidence in Loran are much in evidence in recent months. For example, commitments for the Mark 2 Loran, even before the new design was placed in production, included a contract from the U. S. Signal Corps for the U. S. Army Transportation Service for 175 Lorans and a contract from the U. S. Coast Guard for 20 Lorans.

Facilities for providing operational training in Loran for ship personnel have been estabilshed by Sperry in Brooklyn, Seattle, and San Francisco. Recently the 1,000th Loran certificate was issued to a ship's officer attending the school in Brooklyn. There is a waiting list of ships' officers eager to become familiar with this new navigational aid.

The equipment seldom requires the services of a technician, and adequate service facilities are maintained by Sperry in the principal ports.

Electronic engineers are already looking forward to even more remarkable achievements in the form of improved Loran which will provide positional information automatically and steer a plane or ship on a prescribed course.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Fitting the clutch to the product — instead of the product to the clutch — requires that the clutch be designed, manufactured and applied to meet the product's specific needs. Before you approve the design for your next model — double check to see if it includes all the improvements you can give it — with the right ROCKFORD CLUTCH application. You are invited to utilize the clutch "know-how" of our engineers to give your design the technical clutch advancements that will provide your product with important competitive advantages.
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Purolator Elects Carlos D. Kelly, V.P.

C. D. Kelly

CARLOS D. Kelly was elected vice-president in charge of sales by Purolator Products, Inc., effective January 1. Mr. Kelly has been a director of Purolator since 1942. Purolator Products, pioneers in the filter field, celebrated a 25th anniversary this year, as designers and manufacturers of filters for varied automotive, agricultural, industrial, aviation and special uses. Mr. Kelly, long active in civic and business affairs, is a native of Rumson, New Jersey. He is a vice-president of the Fidelity Union Trust Company, and director of the Franklin Savings Institution in Newark, and an officer of the State Chamber of Commerce, the Newark Aviation Council and Junior Achievement group.

New President for Hill Diesel

ALEXANDER B. ZEITLIN has been elected President and a member of the Board of Directors of the Hill Diesel Engine Corporation of Lansing, Michigan, manufacturers of industrial and marine Diesel engines, and electric generating sets. Mr. Zeitlin also is Vice-President and a Director of Drake America Corporation of New York. According to Mr. Zeitlin, Hill will continue, under the direction of Joseph A. Archer, General Manager, to manufacture the small Diesel engines, the two-, four-, and six-cylinder model "R" series (ranging up to approximately 60 horsepower). All sales of Hill products, both in this country and abroad, will be handled by the affiliated Drake America Corporation of New York, through its Hill Diesel Engine Division.

New Book

"WEAR—As Applied Particularly to Cylinders and Piston Rings," is the title of a recently published book by Dr. F. P. Bundy, General Electric Company, and T. E. Eagan, Chief Metallurgist, The Cooper-Bessemer Corporation, and Ralph L. Boyer, Vice President and Chief Engineer, The Cooper-Bessemer Corporation.

Chapter I, by Dr. Bundy, is devoted to Theory and Research; Chapter II, by T. E. Eagan, goes into Metallurgical Considerations in Wear Resistance; and Chapter III, by Ralph L. Boyer, covers Design Aspects of Cylinder and Ring Wear. An extensive bibliography is appended. Printed on high grade, coated stock, the book is easy to read and the 71 illustrations are unusually clear and informative. This fine contribution to the body of knowledge on piston ring and cylinder wear will be welcomed by diesel engineers. Order from The Cooper-Bessemer Corporation, Mount Vernon, Ohio. Price $3.50.

Fairbanks Morse Sales Appointments

H. H. Berndt W. O. Wright

THE Chicago Branch of Fairbanks, Morse & Co., announces recent changes and additions to its diesel sales department staff.

Mr. H. H. Berndt, formerly associated for several years with Cummins Sales Corporation of Illinois has been appointed diesel field engineer in charge of Northern Illinois territory. Mr. W. O. Wright, formerly diesel field engineer in charge of the Northern Illinois area for Fairbanks, Morse & Co., has been placed in charge of diesel sales actively as field engineer in the State of Michigan.

New Permanent Magnet Catalog Published by General Electric

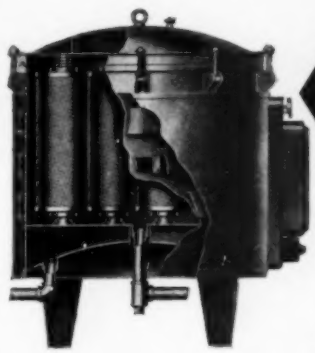
A 28-PAGE illustrated catalog (CDM-2A) describing stocked G-E permanent magnets has been issued by the General Electric Company's Chemical Department. A wide variety of cast and sintered Alnico magnets, as well as special magnetic alloys, are listed. The catalog is devoted to photographs and pull curves illustrating many stocked magnets, and includes drawings of all stocked patterns. Procedures are outlined for requesting quotations and obtaining magnet design assistance from General Electric engineers. Property tables are included for reference. Copies may be had by writing the General Electric Company, Chemical Department, Pittsfield, Mass.

A HEAD with exclusive advantages

for heat savings—for faster, easier cartridge changes

THE HOFFMAN CARTRIDGE FILTER

A new high in modern efficient design has been achieved in the Hoffman Cartridge Filter line. Swing bolts simplify and speed up head removal. Exclusive head-lifting device assures quick, easy access for cartridge replacements. Domed head construction and thick insulation reduce heat loss — save fuel. Today's need for more dependable, effective filtering of fuel and lubricating oils is strong reason for further investigation of the full details on Hoffman Cartridge Filters. Write today for complete information.



FOR 7 x 18 (NAVY) AND 11 x 18 CARTRIDGES

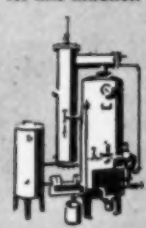
Navy-size (7 x 18) throw-away cartridges are used in one series of Hoffman cartridge filters. Multiples of 1, 2, 4, 7, 9 and 18 cartridges. Another series uses 11 x 18 cartridges, either repackable or throw-away type, in multiples of 1, 2, 3, 4, 6 and 8. Available with or without heaters and controls, to meet service requirements. Filter material can be fullers earth, cellulose or waste.

Write NOW for bulletins A-649 and A-703

FLOTATION UNITS for fully automatic clarification of soluble oil coolants

DISC FILTERS for continuous flow in small space

PRESSURE FILTERS for fine filtration



VACUUM STILLS for solvent recovery

VACUUM FILTERS self-cleaning continuous operation

FILTRATION ENGINEERING SERVICE... For the right answer to your filtering problems, a Hoffman filtration engineer will survey your requirements and furnish recommendations based on detailed analysis of all factors. Ask for this service—There is no obligation.

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FILTRATION DIVISION

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D.E.M.A. Educational Program

WHEN the Diesel Engine Manufacturers Association completes its one-week educational session at the University of Wisconsin next September 3, it will have held, within a year's time, 10 educational meetings—an average of nearly one per month.

The meetings will have been held at widely scattered points of the nation—from Massachusetts to California, and from Wisconsin to Louisiana. They will have been attended by several hundred college and university professors who teach courses related to diesel engineering in the areas in which the meetings are held. Most of these instructors pay their own expenses to these meetings, which are usually arranged at a plant where diesel engines, or diesel engine parts or supplies, are made. Occasionally a session is held at a top-ranking mechanical engineering school.

During the week's diesel engineering Symposium which will get under way August 29 at the University of Wisconsin, the speakers, lecturers and panel members will include the president of the University, Edwin B. Fred; nine of his teaching staff; six visiting college professors; eight diesel engine builders; fourteen parts manufacturers, and two suppliers of diesel fuel and lubricating oils.

Subjects to be covered include "The Diesel Industry in Wisconsin," "What the Diesel Industry Wants from Colleges and Universities," "Fuel Injection Equipment and Problems," "Engine Cooling Problems and Equipment," "Procedures and Equipment Used in Experimental Stress Analysis in the Diesel Field," "Engine Laboratory Instrumentation," "Diesel Operation and Maintenance," "Pistons and Piston Rings," "Wear Testing in the Engine Laboratory," "The CFR Engine As It May be Applied to College Laboratory Work" and "College Laboratory Equipment and Layout." Factory tours of two Wisconsin diesel engine builders—Nordberg Mfg. Co. at Milwaukee, and Fairbanks, Morse & Co. at Beloit—will occupy two afternoons.

The series of 10 meetings referred to began last October when college professors in the Boston area visited two filter factories—Commercial Filters Corp. in Boston, and the Fram Corp. at Providence. Later in the month another educational session was held at the Wood River, Illinois research laboratories of the Shell Oil Company.

On Nov. 9, a meeting was held at the Elliott Company's plant in Jeannette, Pa., where the instructors had opportunity first-hand to see turbochargers made.

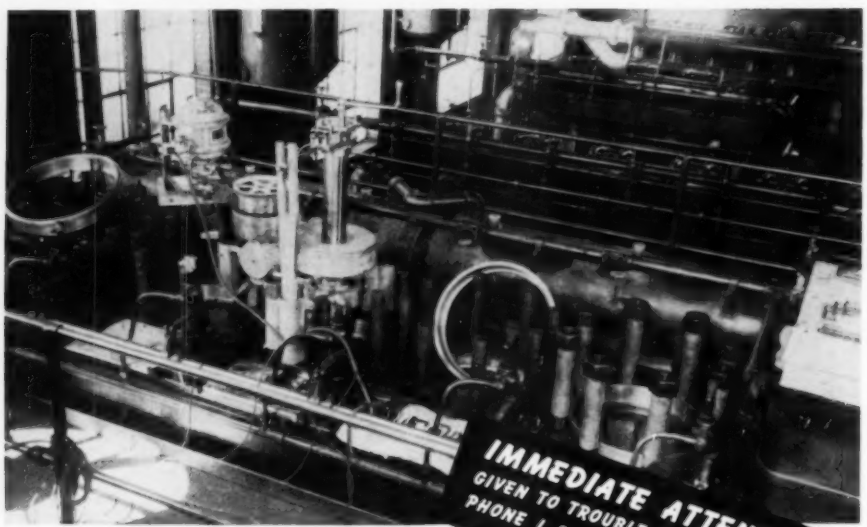
This year's series of educational conferences got under way on January 18, at the plant of Worthington Pump & Machinery Corp. in Buffalo. Cooperating with Worthington were Ross Heater & Mfg. Co., Inc.; Manzel, Inc., and Houde Engineering Division of Houdaille-Hershey Corporation. Two days later another conference was held in Newark, N. J., where Purolator Products, Inc. was host to eastern educators. The Lanova Corporation, Long Island City, N. Y., worked with Purolator in this conference.

On Feb. 8, at Louisville, Ky., a meeting was cosponsored by the C. Lee Cook Mfg. Co. and American Air Filter Co., Inc. Technical sessions were held at the Brown Hotel, followed by inspection of manufacturing and laboratory facilities of each company. On Feb. 10 a day's meeting was sponsored by the Esso Standard Oil Company at Baton Rouge, La.

The third meeting to be held during February was staged at the U. S. Naval Experiment Station, Annapolis, Md., on the 24th. The Navy, world's greatest single user of diesel engine power, was host for the day. Talks were given by the Station's personnel, and inspection tours were conducted through the diesel laboratory, the gas turbine laboratory, and through other research facilities.

Future meetings to be held this spring are being planned for Chicago and for Los Angeles, where the University of California will be host. All meetings, regardless of where they are held or who the hosts are, have three things in common. First, the guests are invariably instructors in diesel en-

ON LOCATION REPAIR TO LARGE ENGINES



Here's a job typical of our on-the-job repair service, which is saving our customers thousands of dollars annually in the reclaiming of expensive parts, as well as keeping shut down time to a minimum. This engine is in an electric generating plant in Mississippi. The original liner seats in the main frame were cracked and leaking. Restoration to full operating efficiency was urgent as the casualty occurred at the beginning of the peak demand season.

All damaged seats were bored out with portable equipment, and forged steel liner seats machined to standard factory sizes and installed in record time.

Our experienced personnel and the many special portable machines at their disposal are on twenty-four hour call to any trouble spot. Crankshafts, engine bed plates, frames and cylinders may be successfully brought back to factory precision in minimum time and with great savings.

Our shops are adequately equipped and manned to handle the largest, most difficult repair jobs in the Diesel Industry.

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WASHINGTON IRON WORKS, INC.

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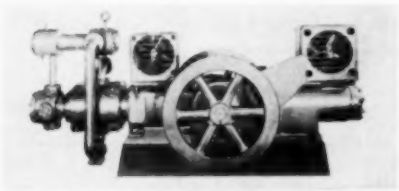
DIESEL ENGINEERING PROBLEMS OUR SPECIALTY MANUFACTURING AND REPAIRING

gineering from the country's leading mechanical engineering schools. Second, they hear technical talks by experienced engineers from the industry which acquaint them with commercial engineering practices and problems. Third, they are provided the opportunity of seeing first-hand in the manufacturing plants, how the engines, parts and supplies are manufactured. The overall effort assists those professors who attend the meetings in obtaining a better understanding of the industry, which is most helpful to them in their day to day work as mechanical engineering instructors.

This tie-up between school and factory is a practical educational project without parallel in the annals of American industry. It is a long-range effort that will require time for its fruition, and that is why its sponsor, the Diesel Engine Manufacturers Association, has allotted five years in which to carry it out.

New Engine-Driven 2-Stage Compressor

DEVELOPMENT of a new direct-connected, engine-driven two-stage gas or air compressor is announced by the White-Roth Machine Corporation. Known as the Lorain Model O-10TS Compressor, the unit is in quantity production and available for early delivery.



Lorain Model 0-10TS Compressor for gas or air.

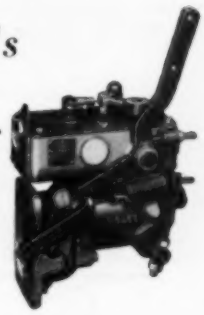
Designed to compress large volumes of gas or air, the unit consists of a low-stage and a high-stage compressor cylinder driven by means of a crosshead by the Lorain Model O Multi-Fuel Engine. The Lorain Model O-10TS Compressor is available complete with American-Bosch fuel pump for operation on diesel oil, or with Ensign carburetor and Bosch magneto for operation on natural gas or butane. The manufacturer states that engine conversion can be accomplished on the job in approximately 90 minutes.

Compressor cylinders, with circulating-water cooling system, have top suction and bottom discharge for gas condensates. Engine power cylinder is cooled by circulating water or by a condenser-type system incorporating a belt-driven fan. Large capacity oil reservoir with combination splash and force feed provides adequate lubrication for all load or temperature conditions. Optional equipment: Air starting valves or gasoline-driven Lorain Friction Starter, flywheel guards, steel base.

Order Your Copy of the 1948 DIESEL ENGINE CATALOG, Vol. 13 now. Thoroughly revised — more complete — indispensable. Convenient order coupon on page 80.

When you look

at Diesels look for PIERCE



● Pierce governors as standard equipment offer you extra value in engine performance and operating costs.

1. The centrifugal principle of balanced counterweights gives exact control of engine R.P.M. to meet the varying conditions of any job. Engine protection is guaranteed.

2. Precision built, Pierce governors give trouble free operation—usually for the life of the engine.

3. Engine operation costs less with Pierce—better performance and less maintenance.

Many diesel engines are Pierce equipped. Pierce replacement governors to fit most engines are available through your local distributor.

Write to 1603 Ohio Avenue, or call Pierce Governor in Anderson, Indiana, for distributor name and complete information.

WHEREVER GOVERNING IS REQUIRED . . . PIERCE IS YOUR FIRST CONSIDERATION

PIERCE GOVERNORS

D.E.M.A. Holds Another Successful District Meeting

AN interesting and instructive meeting, sponsored by D.E.M.A. for the purpose of bringing engineering instructors and manufacturers together, was recently held in Louisville, Kentucky. Co-sponsors of the meeting were American Air Filter Company, Inc. and C. Lee Cook Manufacturing Company, Inc., both of Louisville. The meeting was attended by upwards of fifty engineering school heads and professors, engineering and sales representatives of the diesel engine industry, pipe line company engineers and trade publication editors. This was another of the many district educational meetings which D.E.M.A. has been conducting with the co-sponsorship of concerns located in various parts of the country all of which have proved highly successful and beneficial to those attending.

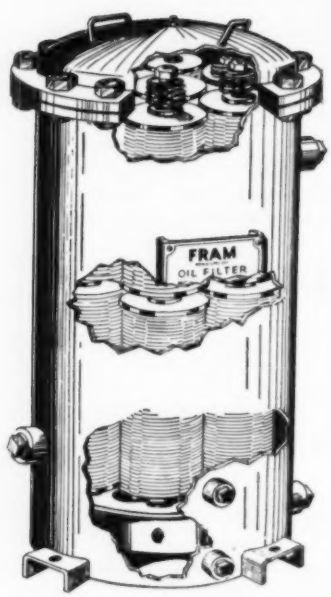
The meeting was divided into morning and afternoon sessions, each followed by plant inspection trips. The morning session was conducted by C. Lee Cook Manufacturing Company and following introductory remarks by Robert E. Kirn, Vice President, a paper on "The Metallurgy of Iron—Piston Ring Iron" was given by F. D. Durham, President of C. Lee Cook Manufacturing Company. This was followed by a paper entitled "Introduction to Engineering the Piston Ring" by Robert E. Kirn, the third paper in this session being given by C. J. Kremer, Jr., Assistant to the President, on the subject "Engineering the Piston Ring." All told these three papers took the group through the basic elements of piston ring metallurgy and design and were well rounded out with discussion and then a trip through the C. Lee Cook Manufacturing Company plant where piston ring manufacturing methods were studied.

Following a very pleasant luncheon, American Air Filter Company took over the meeting with a welcome address by W. M. Reed, President, followed by four papers as follows: "Air Filter Origin" by Howard M. Fitch, Assistant to Executive Vice President; "Dust—A Problem" by Chas. W. Williams, Chemical Engineer; "Air Filter Design—Application" by Robert W. Sexton, Research Engineer, and "Air Filter Demonstration" by Dwight M. McMakin, Assistant Manager Engine and Compressor Division. Following these highly interesting papers, the authors formed a panel under the chairmanship of Mr. A. Nutting, Vice President and Chief Engineer, and lively discussion ensued. John R. McConnell, Vice President, then spoke briefly on the company's interest in graduate engineers letting the educators present know that his company would be glad to interview engineering students who are interested in the air filtration field. The group was then conducted through the American Air Filter Co. plant where they had an opportunity to see the many types of air filters manufactured by this company in production.

Oakite Releases New Cleaning Manual

A THOROUGH-GOING yet concise guide to improved methods that expedite degreasing, descaling, cleaning and related tasks in power plants, is available in an 18-page illustrated Service Digest recently published by Oakite Products, Inc., New York. The Digest presents in convenient form helpful data on specific materials and procedures for performing more than 70 commonly recurring maintenance cleaning and allied operations in Steam Central Stations, Electrical Power, and Diesel Power Plants. Power engineers will find helpful its many recommendations on equipment repair and maintenance, on steam-detergent cleaning, and on simplified paint-stripping procedures. Of special interest is the valuable information provided on scientific, safe methods for removing scale from heat exchangers, surface condensers, superheating apparatus, engine cooling systems, steam or water-jacketed equipment. Readers desiring copies of this new digest may obtain them, without charge, by addressing Oakite Products, Inc., 122D Thames Street, New York 6, N. Y.

FRAM FILTERS *Cut Costs...*



Extend Overhaul Periods

Read this 3 year performance record . . .

AT Springfield Bronze and Aluminum Co., Springfield, Mass., overhauls used to be required every 8000 hours on their 100 h.p. Diesel generator. Today, under the same grueling 24-hour running conditions, Fram Filters have extended overhauls to 20,000 hours.

GOOD CONDITION

Previous overhauls showed piston rings in poor condition, all at least partially frozen. Lube oil was black, dirty, laden with contaminants. Since installing Fram, the last overhaul was made after 833 days of continuous operation. The general condition of the engine was very good with "blow-by" at a minimum.

CUTS LUBE COSTS

The company calculated that the average cost of keeping lube oil clean to a .01 naphtha insolubles standard is 2 cents per hour, with oil change periods of 1000 hours compared to oil changes every 200 hours as previously required.

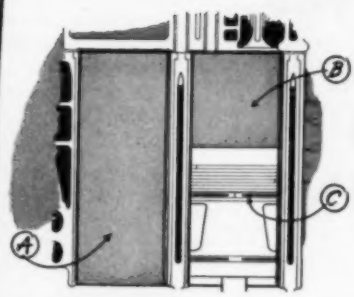
WRITE TODAY . . . Let Fram's Research Department help you determine how Fram Filcron Filters can give you lower operating costs and increased efficiency. You're sure of top performance because Fram Filters are *unconditionally guaranteed*. Write the Fram Corporation, Providence 16, R. I. *In Canada:* J. C. Adams Co., Ltd., Toronto, Ontario.

FRAM *Filcron*

THE MODERN OIL FILTER

STANDARD ENGINEER'S CASE FILE

Case D119E—Reducing Wear on Liners in Diesels



DIESEL ENGINE LINERS AND PISTON

In high-speed Diesel engines lubricated with RPM DELO Diesel Engine Lubricating Oil, wear on liners was held to a minimum with little variation over their entire areas. A constant lubricating film was maintained on them even in high-temperature belts. RPM DELO Oils are recommended for all types of Diesels. Come in all viscosity grades necessary for your engines.

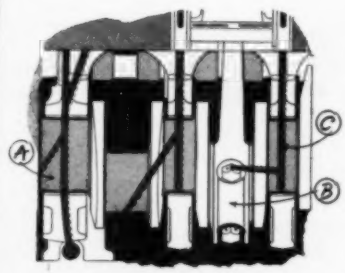
A. Special additive provides metal-adhesion qualities...keeps oil on all parts whether hot or cold, running or idle.

B. An anti-oxident resists formation of lacquer—resistance to extreme heat provides lubrication in the toughest conditions.

C. Contains detergent which keeps rings clean and operating freely...prevents scratching and gouging of liners.

RPM DELO Diesel Oil will not corrode any bearing.

Case D119F—Prolonging The Lives of Diesel Bearings



SECTION OF DIESEL ENGINE CRANK AND CAM

No bearing failures occurred between overhaul periods in Diesel engines used in the toughest service when they were lubricated with RPM DELO Diesel Engine Lubricating Oil.

A. Non-corrosive to all types of bearing metal...inherent ability of base stocks and added compound resist oxidation and formation of acid which is common cause of bearing corrosion.

B. Maintains a tough lubricating film which withstands excessive shocks and pressures.

C. Special detergent compound keeps oil passages clean and open - allows free flow of lubricant to vital points.

Another compound in RPM DELO Oil prevents foaming of the oil. An accurate measurement of crankcase levels can always be obtained.

For additional information and the name of your nearest Distributor, write

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DIESEL ENGINE RPM DELO LUBRICATING OIL

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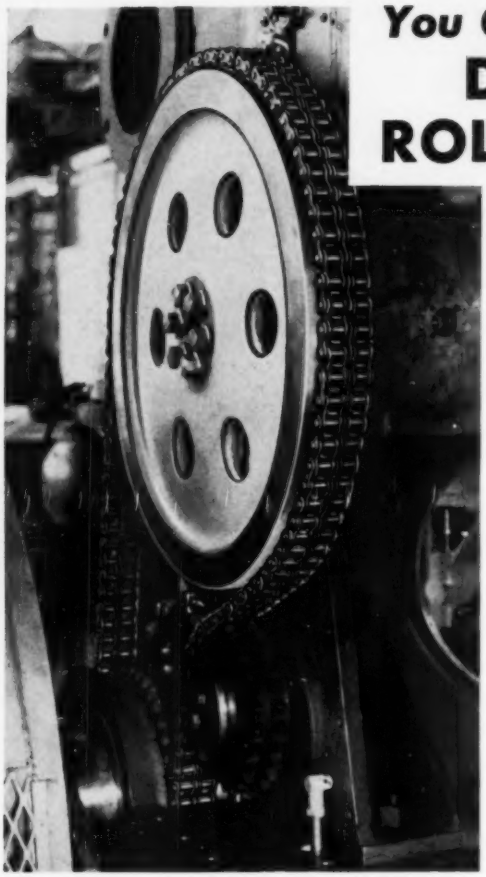
Erie Combats Smoke With Diesel Locomotives

APPROXIMATELY a month ago, Erie officials announced that 26 diesel-electric switching locomotives have been ordered at a cost of $2,300,000 for operations in various communities along the line. Four 1,000-hp. units, costing more than $400,000, are scheduled for assignment in 1949 to the Binghamton yards and the Binghamton-Endicott switching area. Officials estimated that nine steam locomotives will be eliminated from the Binghamton area by the new switchers.

In the last four years the Erie Railroad's purchase of diesel-electric locomotives has increased steadily. In 1944 it owned only 18 diesels. It now has 153 in use and on order.

In July 1947, the Erie completely dieselized all of its through-line passenger trains operating between Jersey City and Chicago. Last year it assigned nine big diesels to long haul freight service east of Hornell. Two more diesels will be placed in service in this district early next year. As these modern engines were added to these runs, the railroad has gradually reduced the amount of smoke by eliminating the number of coal-burning engines operating through Binghamton.

For Well Designed Engine Camshaft Timing Drives



You Can Be Sure With DIAMOND ROLLER CHAINS

DIAMOND Roller Chain Drives involve *fewer shafts* and *bearings;* simple adjustments obviate need for extremely close centers; load is spread over numbers of sprocket teeth, and separating forces are absent.

Quietness and long life are due to uniform accuracy in chain manufacture plus the muting and lubricating effect of the oil film within the chains. Inherent elasticity compensates for heat expansion of engine and torsionals. If replacement is ever required, new chain can be put over original sprockets with no major dismantling.

DIAMOND CHAIN COMPANY, Inc., Dept. 407, 402 Kentucky Avenue, Indianapolis 7, Indiana. *Offices and Distributors in All Principal Cities.*

Engine Drive Booklet DDD illustrates a wide variety of drive applications. Write today.

DIAMOND ROLLER CHAINS

LeTourneau Adds 3 New Tools

THE announcement has been made by the R. G. LeTourneau, Inc. of three new tools to its line of earthmoving and materials handling equipment —the E-35 Tournahopper, the E-40 Tournarocker, and the E-25 Carryall Scraper.

Model E-35 Tournahopper

For bottom-dump hauling, the E-35 Tournahopper is a 27 yard or 35-ton capacity unit which can travel at speeds up to 30 mph. It is powered by a 240 hp., 2-wheel prime mover, and has multiple-disc 4-wheel air brakes which provide 5135 sq. in. of braking surface.

Model E-40 Tournarocker

The E-40 Tournarocker, a rear dump wagon, is also powered by a 240 hp., 2-wheel prime mover. The E-40 Tournarocker has a 41 cu. yd. capacity and a rear dump which is multi-cable controlled by an electric motor which tips the body beyond vertical position for fast dumping. Four-wheel disc type air brakes with 5135 sq. in. of breaking area give safe control.

Model B Tournapull with Carryall Scraper

Also taking its place in the LeTourneau line is the E-25 Carryall Scraper, also powered by the 240 hp., 2-wheel prime mover. Being supplied because of contractor demand, this Tournapull-Scraper possesses all the design features associated with the new line of LeTourneau equipment.

Order Your Copy of the 1948 DIESEL ENGINE CATALOG, Vol. 13 now. Thoroughly revised — more complete — indispensable. Convenient order coupon on page 80

New Automatic Fire Protection

STOP-FIRE, INC., designers of modern fire protection equipment, announce Underwriter's Laboratories listing of their Automatic Sprinkler "portable system" fire extinguisher.

This unit, constructed of heavy brass, silver welded, needs no piping or other installation. Hang it up and it is ready to operate, utilizing the new fire extinguisher fluid known as C.B.M., or Chlorobromomethane. Flame does not have to touch this unit. When fire occurs, heat waves cause an approved sprinkler head to discharge under pressure a wide, fast-moving spray of combined carbon dioxide and atomized Chlorobromomethane. This quickly blankets and snuffs the fire. It is non-freezing, and has minimum specification capacity of 700 cu. ft.

G. E. Plans New Service Shop-Warehouse

GREATLY expanded repair, maintenance, and warehousing facilities for increasing service on General Electric apparatus in the states of Utah, Idaho, Montana, and Nevada, will be established in Salt Lake City by the G-E Apparatus Department, it was announced recently by B. C. J. Wheatlake, manager of the company's Salt Lake City office.

Estimated to cost approximately $500,000, the facilities will increase warehouse space nearly 50 per cent and will more than double the present capacity for service and repair of motors, generators, transformers, control devices, and assembly of special switchgear. The service will be used by mines, smelters, power companies, and other industrial concerns in the four states.

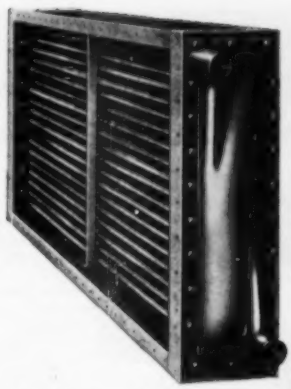
The new facilities coupled with those opened in Denver in 1946 will give the Rocky Mountain area "one of the most up to date G-E service organizations in the country," according to Mr. Wheatlake. G.E. has 29 such installations throughout the country. The latest lighting, machinery layout, and wiring systems, which will speed the flow of work through the shop and warehouse, will be incorporated in the building. Plans also call for traveling cranes in the main bays. The building will be serviced by a railroad siding.

Oil Inspection Kit

THE Gerin Corporation is distributing a new booklet No. 300, "Required Equipment for Lubrication Control." It illustrates the portable oil inspection kit recently announced by the company whereby any mechanic can quickly measure the contaminants occurring in lubricating oil during use. Simplified yet accurate methods are explained for measuring asphaltic and other deposit forming contaminants. Tests can be completed in a few minutes for various types of oils.

Figure it at

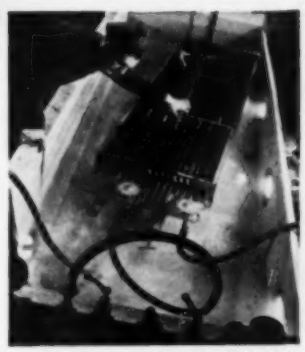
100% FULL RATING



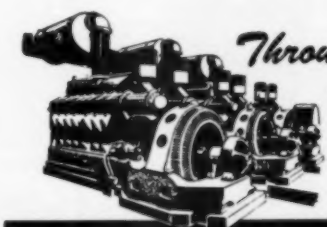
AEROFIN RATINGS ARE ACCURATE AND RELIABLE

Aerofin's continued research has developed accurate ratings that are good for the life of the unit. You can always count on Aerofin to deliver full-rated capacity – full efficiency.

Over 25 years' experience, combined with unequalled production facilities, enables Aerofin to select just the right surface and materials for each particular job. Aerofin rigidly controls every phase of the production of its heat-transfer coils and units.



This man is looking for air bubbles – he is testing Aerofin heat-transfer coils with air pressure in a specially illuminated tank. If there are no bubbles, it means the immersed Aerofin unit has withstood the severe strains of steam and hydrostatic pressure tests and is ready to give you long, efficient service.



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Aerofin units do the job Better, Faster, Cheaper

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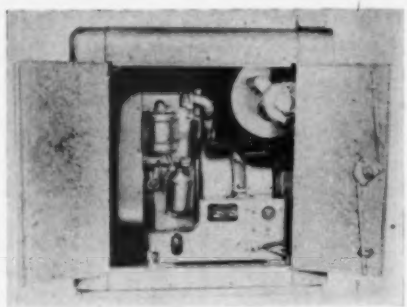
Nordberg Opens in New Orleans

THE Heavy Machinery Division of Nordberg Manufacturing Company, Milwaukee 7, Wisconsin, has opened a combination Sales and Service Office at 527 City Park Avenue, New Orleans, Louisiana. Mr. W. J. Moran, who has represented Nordberg in the South Central Territory for the past several years, is District Manager. Mr. H. F. Wagner, formerly of the Milwaukee office, will assist Moran as Sales and Service Engineer. To better facilitate service in the territory a stock will be carried of spare parts for Nordberg two and four-cycle diesel engines.

American Brake Shoe Announces Elections

KEMPTON DUNN was elected Vice-President and Cyrus E. Brush was elected Secretary of the American Brake Shoe Company at the February meeting of the Board of Directors according to an announcement by William B. Given, Jr., President. Mr. Dunn has been with Brake Shoe since graduating from college in 1932. Elected Treasurer of the company in 1942, he assumed the additional duties of Secretary in 1947. He will continue to serve as Treasurer of the company. Mr. Brush first joined Brake Shoe in 1946 as an attorney upon his return from service with the U. S. Navy. He became Assistant Secretary of the company in 1947. He is a member of the Bar Association of the City of New York.

Onan Packaged Diesel Electric Plant



ONAN packaged diesel electric plant.

A NEW, 2,500 watt packaged diesel electric plant will be presented at the National Railway Appliance Association show in Chicago by D. W. Onan & Sons Inc. The 2½ kw. air-cooled, diesel-powered electric plant is installed in a sheet-steel housing which is compact. The inner surfaces of the housing have a ⅜ in. layer of sound proofing and fire proofing material. Two hinged doors secured by locking side bars are provided on two sides of the housing. A fresh air intake is provided in the top housing panel.

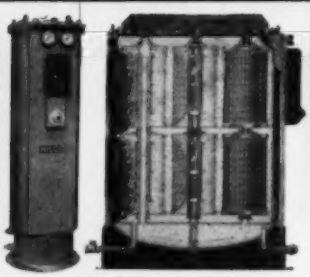
This diesel electric plant is driven by the new Onan DSP air-cooled, diesel engine. Electric cranking of the engine is made possible by a specially designed automatic compression release. Rated at 2,500 watts, the plant has an Onan inherently regulated generator which provides voltage regulation without the use of rheostats or other external equipment. All generator and engine controls required for operation are located on the steel base. Approximately 0.136 gallon of fuel is required per kilowatt hour at full rated load.

Resistance Heater Catalogue

A 4-PAGE Resitsance Heater Catalogue has just been released by the Agnew Electric Company, Milford, Michigan. It describes Resistance Heaters that provide low operating cost (7 to 8 pounds per kwh. at 2300°F) and proportionately great economies for annealing and other lower temperature operations. With resistance heating the work is gripped between electrodes and low voltage, high amperage current flows through the work, its resistance causing it to heat. The low voltage, high amperage current used is obtained from a transformer built in the machine and connected to any standard power supply. Any work that can be gripped by electrodes and is of approximately the same cross section area can be heated by this method. A certain section or sections can be heated and when necessary, there can be a sharp demarcation between the heated and cool zones. These machines can be of the semi-automatic type with manual loading and unloading and automatic cycle after the work is inserted or fully automatic machines can be furnished with automatic loading and ejection.

There's a HILCO that will best fit into your Lubricating and Fuel Oil Filtering Plans . . .

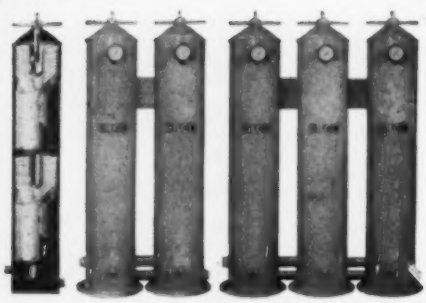
HILCO HYFLOW OIL FILTERS "S" SERIES



HILCO HYFLOW OIL FILTERS "R" SERIES SPACE SAVERS

For lubricating oil or storage to engine fuel oil filtering using 5" x 11" and 7¼" x 18" Filter elements. Easy and quick to service.

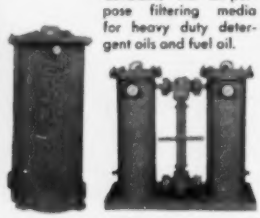
For lube oil using one or a multiple of 11" x 18" Filter cartridges easily handled by the operator, offering large filter area and proper depth to assure complete saturation of filter material. Available with and without heaters.



*Both are interchangeable at any time.

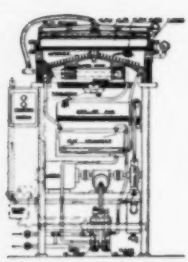
Hilco Hyflow Oil Filters use Hilite-Fuller's Earth for filtering straight mineral and fuel oil or Hiltex-Cellulose, the all-purpose filtering media for heavy duty detergent oils and fuel oil.

HILCO HYFLOW OIL FILTERS "C" SERIES



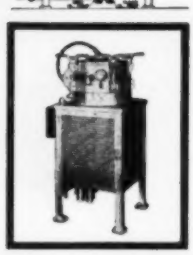
For Lube and Bulk Fuel using one or a multiple of 7¼" x 18" Filter cartridges offering the maximum in filter area and correct depth for high flow rates and efficient filtration. Available in simplex type with or without heaters, duplex without heaters.

HILCO OIL RECLAIMERS



For direct connecting to one or more engines for perfect and complete lube oil purification—removing carbon, sludge, abrasives, tarry matter, and acids, water and fuel dilution — and color restoration.

Hilite-Fuller's Earth for filtering straight mineral oils—ADSTAY DISCS for heavy duty detergent oils.



CLEAN OIL MEANS CLEAN ENGINES LOWER MAINTENANCE COSTS . . . .

WRITE TO-DAY! FREE LITERATURE

LET US RECOMMEND THE CORRECT OIL PURIFICATION EQUIPMENT

THE HILLIARD CORPORATION

122 W. Fourth St., Elmira, N. Y.

Whether you build or operate **DIESELS** it will pay you to insist on

SEALED POWER PISTONS

SEALED POWER SLEEVES

SEALED POWER RINGS

FOR ORIGINAL EQUIPMENT . . . Leading Diesel engine builders in truck, tractor and equipment fields have long preferred Sealed Power Products.

FOR REPLACEMENT . . . Leading distributors carry Sealed Power motor parts to meet Diesel engine needs.

SEALED POWER LEADS THE FIELD . . . Whether you build or operate Diesels, Sealed Power offers you the full resources of the industry's finest technical staff, laboratories, and manufacturing facilities. For longer life and greater efficiency insist on Sealed Power!

SEALED POWER CORPORATION
MUSKEGON, MICHIGAN

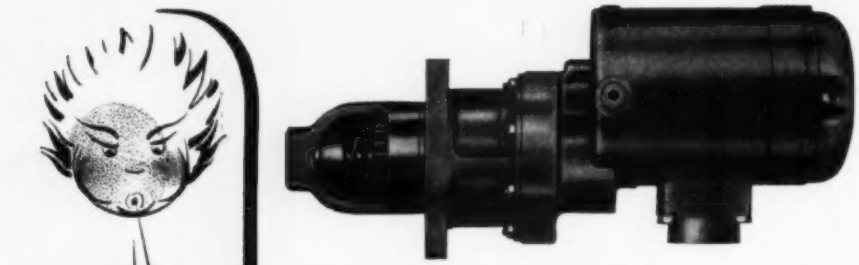
Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

New Bulletin Describes Diesel Courses

UTILITIES ENGINEERING INSTITUTE of Chicago announces the publication of a new, illustrated 72-page catalog which includes full descriptive information concerning all U.E.I. courses of training.

This pioneer trade school, which has been training men for industry since 1927, offers both home-study and resident training, and has recently enlarged its diesel training facilities to include an evening course in the resident diesel division. Designed for the convenience of men employed during the day, U.E.I.'s new diesel course offers intensive training in operation, maintenance, and service of all types of diesel installations, according to information contained in the new catalog. Both day and evening resident classes in diesel are available to veterans under the G.I. Bill. Non-veterans or veterans who have already used their G.I. educational privileges may qualify for either home-study or resident training upon application. Full information may be had upon request. Write for the new U.E.I. catalog to Utilities Engineering Institute, Dept. GB-1, 2525 North Sheffield Avenue, Chicago 14, Illinois.



FOR QUICK, SAFE, DEPENDABLE STARTING . . . LEECE-NEVILLE

put air to work

Air Cranking Motor

● Absolutely safe starting of Diesel and gasoline engines in explosive atmospheres is realized when air is put to work in this cranking motor. This motor also offers economical, dependable starting in numerous other applications where compressed air or natural gas under suitable pressure is available. Once installed, it can be practically forgotten for it requires no maintenance and its use eliminates bothersome battery problems! See your nearest Leece-Neville Service Station for further details or write *The Leece-Neville Co., Cleveland 14, Ohio.*

CONSIDER THESE 6 BIG ADVANTAGES!

- Compact, rotary motor occupies no more space than electric starter—can be installed with same three bolts used for mounting electric starter.
- Built-in automatic oiler assures constant and thorough lubrication of motor.
- No device for trapping moisture required as moisture from air lines is used for supplementary lubrication.
- Chrome-plated rotor and liner of motor and bronze end plates for corrosion resistance.
- Exhaust outlet at bottom of motor permits natural drainage of any moisture which may collect in the motor.
- Rotor mounted on precision type ball bearings.

LEECE-NEVILLE

Pioneer and STILL Quality Leader

Use of Diesel-Electric Switchers by Utilities Increased in 1948

NINE electric utilities replaced steam switching locomotives with GE diesel-electric switching units during 1948, according to J. W. Brauns, Manager of General Electric's Industrial Haulage Division. This continues a trend that has been in evidence since the end of the war when government priorities were lifted. More than a score of power companies now use 25-, 45-, and 65-ton GE locomotives for yard switching.

25 ton G.E. diesel electric switching locomotive owned by Potomac Edison Co.

Since coal is plentiful at most steam generating plants, most utilities have considered steam the logical and economical choice for coal hauling and freight transfer. However, actual operating experience is showing that diesel-electrics deliver these services for less-than-steam cost, according to Mr. Brauns.

A comparative cost study, extending over a year and a half, was made at one plant of an eastern utility after diesel-electric had replaced steam. This study showed that one GE 25-ton locomotive had saved the utility more than $4200 in one year.

Two 65-ton units have been placed in operation this past year by the Cleveland Electric Illuminating Co. These diesel-electrics are now working 16 hours a day. Illinois Power Co. now operates two 45-ton GE switchers.

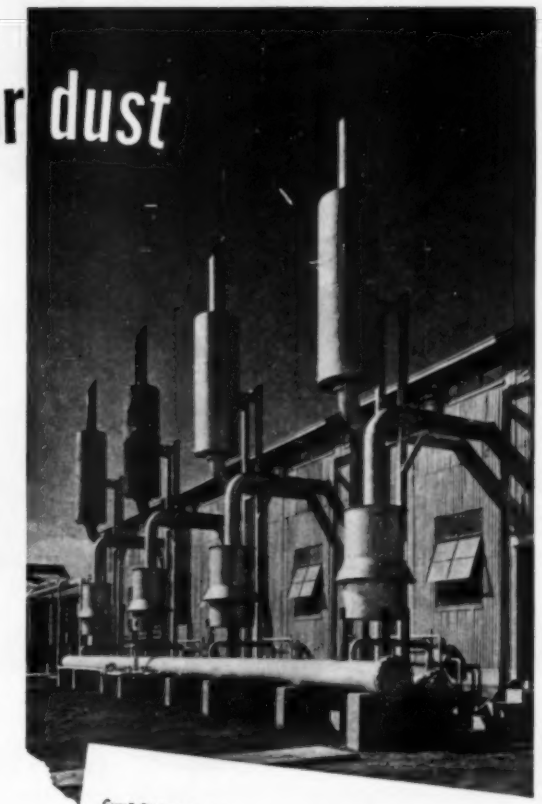
Former Sub-chaser Repowered

After receiving more than 20 years of service from one Cummins Diesel, Francis Millerd Company, Vancouver, B. C., recently repowered the 110-foot fish packer *Great Northern No. 1* with another Cummins Diesel. The new Cummins Diesel has a seven-inch bore and a 10-inch stroke, and turns at 800 rpm. It is equipped with a Capitol 2:1 Marine Reverse and Reduction Gear, and swings a 48-inch, right-hand, three-bladed, Coolidge-type propeller. *The Great Northern No. 1*, shown heading north through Welcome Pass in the inside passage on her first trip after being repowered, is making 11 knots. Originally used as a sub-chaser by the United States Navy in World War I, the fish packer is one of four Cummins-powered boats owned by Francis Millerd Company.

Sudden death for dust

and savings for you...

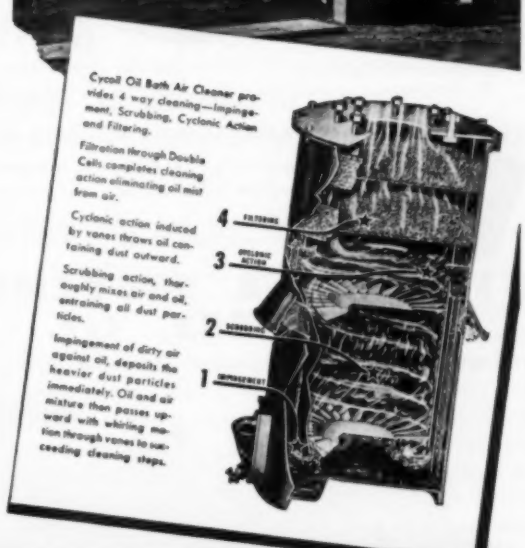
when Cycoil Oil Bath Cleaners stand guard over engines and compressors



THERE'S plenty of dust but no dust problem at this Texas refinery. Every engine breathes air that is filtered free of dust and dirt by Cycoil* Oil Bath Air Cleaners.

Cycoil is a permanent "death house" for dust. Over 90% of the total fine dust content of the air is trapped in a Cycoil even before reaching the filter cell. Positive oil circulation for continued self-cleaning action, plus the additional filtration to be had in the filter pads, assures approximately 100% clean air.

You can't escape dust but you can stop it effectively and permanently at the intake with Cycoils—and they will return their cost quickly with the elimination of costly repairs and shutdowns due to dust damage. Write for copy of Bulletin 130-D.


Cycoil Oil Bath Air Cleaner provides 4 way cleaning—Impingement, Scrubbing, Cyclonic Action and Filtering.
Filtration through Double Cells completes cleaning action eliminating oil mist from air.
Cyclonic action induced by vanes throws oil containing dust outward.
Scrubbing action, thoroughly mixes air and oil, entraining all dust particles.
Impingement of dirty air against oil, deposits the heavier dust particles immediately. Oil and air mixture then passes upward with whirling motion through vanes to succeeding cleaning steps.
4
3
2
1

AMERICAN AIR FILTER COMPANY, INC.
408 CENTRAL AVENUE • LOUISVILLE 8, KY.
In Canada: Darling Bros. Ltd., Montreal, P. Q.

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AAF Cycoil OIL BATH AIR CLEANER
AND INTAKE SILENCER

400 kw Portable Power Plant
75 kw Generator Set
UNITIZED POWER
for every industry
Portable Pumping Units
Complete Overhead Irrigation Systems
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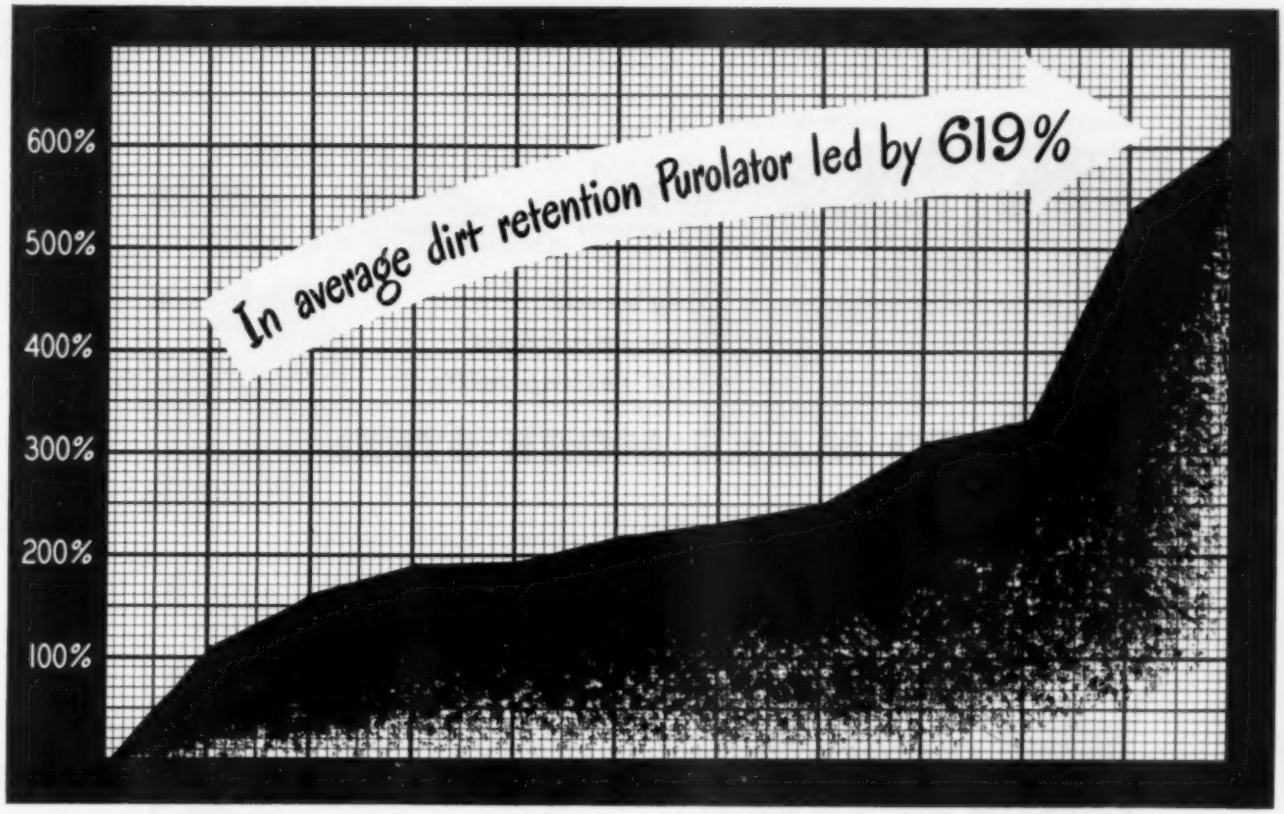
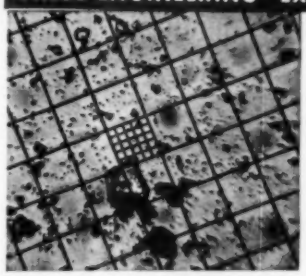
Whatever your power needs, whatever the application, Stewart & Stevenson can help you if you have a power problem.
FOR FULL INFORMATION, PHONE, WRITE OR WIRE
COMPLETE FACILITIES ALL UNDER ONE ROOF:
• Engineering • Design and layout
• Complete installations • Parts and service
All units can be furnished with either diesel engines or gas, gasoline or butane engines.
STEWART & STEVENSON SERVICES, Inc.
4516 HARRISBURG BLVD. • HOUSTON, TEXAS • PHONE W. 6-9691
75 kw Mobile Diesel Electric Power Plant
Combination Oil Field Rig Lighting, Welding and Auxiliary Unit
THE NATION'S LARGEST DISTRIBUTORS OF GM DIESEL ENGINES



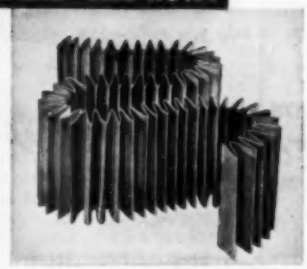
No wild claims – just *PROOF!*

COMPETITIVE TESTS SHOW PUROLATOR'S MICRONIC OIL FILTER SIDETRACKS AN AVERAGE OF 290% MORE ABRASIVES THAN COMPARABLE SIZE FILTERS!

THESE ENGINEERING "EXTRAS" TELL HOW!



Filters Micronic Particles. In Government tests on oil filters, with approved Test Dust containing graded dust ranging from one micron on up, Purolator's *specially designed Micronic element* filtered 97.8% on the very first pass-through.



5 Times Greater Filtering Area. The revolutionary accordion-pleated design of the Purolator Micronic Filter provides an area 5 times that of old-style filters. "Open area," too, is much greater than that of comparable size filters.

PUROLATOR
MICRONIC OIL FILTER

• Lengthen the life of your Diesels . . . keep maintenance costs down . . . by using the *most efficient* oil filter!

That, of course, means a Purolator *Micronic* Diesel Filter . . . proved by test to be far ahead of its nearest competitor in all-important dirt-retention (due to the exclusive element that traps micronic particles as small as .000039 of an inch—and the extended area design shown at left). For *fuel oil* filtration, Purolator does the *complete* job so vital because of close tolerances of injector plungers—and the microscopic smallness of injector tip orifices. And for *lubrication oil* filtration, Purolator's greater efficiency assures less wear on hard-working bearings.

Let us show you how the Purolator Micronic Refill can lengthen life . . . reduce upkeep . . . for *your* Diesel engines regardless of their type or of the make of original filter unit. And let our highly experienced engineering staff help you with any special filtering problem you may have.

PUROLATOR PRODUCTS INC.
Newark 2, New Jersey and Windsor, Ontario, Canada

BAKERY

RAILROAD

WOODWORKING

SHIPYARD

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DISTILLING

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RESTAURANT

LAUNDRY

SHIPPING

PACKAGING

CHEMICALS

FOOD PRODUCTS

UTILITY

GLASS

PETROLEUM

They're all equally as important as mines and rolling mills

TO MAKE MORE STEEL

Half the melting stock used in a steel mill or iron foundry consists of scrap.

In normal times, enough scrap is produced by the mills, foundries, railroads, scrap dealers and fabricators to fill the need.

But although the mills are now working at capacity, the greatly increased demand for steel and castings has outstepped the supply of the heavy scrap that makes the best steel—and at the fastest rate.

The quickest way to increase the production of steel and castings is to increase the supply of heavy scrap.

That is why we are calling on plants in NON-METALWORKING industries to provide the needed heavy scrap NOW.

One million extra tons are needed!

You Have the Heavy Scrap Needed to Make More Steel

Enough obsolete machinery, equipment and parts are being carried as useless inventory in *non*-metalworking plants to give a big push to the production of steel. Surveys have proved this.

The trick is to get that old iron and steel into the hands of the steel producers and foundries.

We're putting that job up to *you*.

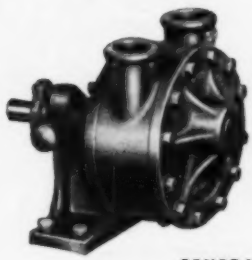
To help increase steel production . . . provide more steel for fabricating the equipment you want . . . *to build an emergency reserve for national security* . . . turn in your useless heavy scrap to your local scrap dealer.

What You Can Do to Help Step Up Steel Production

1. Appoint one top official in your plant to take full responsibility for surveying the plant and getting out the heavy scrap.
2. Consult with your trade association's Scrap Drive Committee about its program to help the scrap drive.
3. Call on your local scrap dealer to help you work out a practical scrapping program.

Editor—DIESEL PROGRESS

designed for carefree performance...



That's why it pays to specify TUTHILL

GENERAL PURPOSE PUMPS

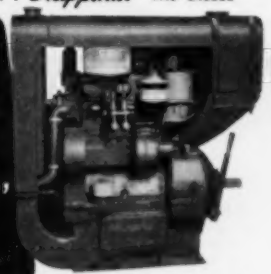
• Low first cost • Negligible maintenance • Compact design • Operates dependably in either direction of rotation • Capacities to 200 g.p.m. • Pressures to 100 p.s.i. • Direct drive, slow-speed V-belt units and stripped models

Write for Model C bulletin.

TUTHILL PUMP COMPANY
939 East 95th Street . Chicago 19, Illinois . Phone RE 4-7420

DIESEL'S THE POWER . . . *Sheppard's* THE DIESEL

PUT NEW "Muscle" into "weary" equipment



- 33 H.P. two cylinder power unit. Delivered ready for work.
- Efficient full-diesel operation on any one of 15 different fuels.
- Simplified fuel injection. No complicated assemblies.
- Available as 2,000 to 36,000 watt generating set for night lighting or auxiliary use.

Put your equipment back on a *paying* basis with Sheppard Diesel power. Keep it on the job 3 to 5 times longer between engine overhauls. Handle only half as much fuel . . . save up to 75% on fuel costs! Send for FREE Sheppard booklet that shows how to put new life into your "tired" machines.

DEALERS—There's a big market for 3.5 to 100 H.P. Diesels. Investigate a profitable Sheppard franchise.

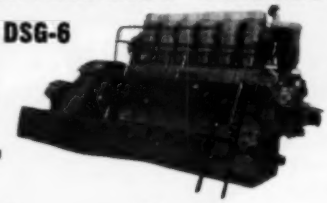
SHEPPARD DIESELS, Hanover 8, Pa.

Sheppard

STATIONARY AND AUTOMOTIVE **DIESELS**

NEW ENTERPRISE DIESELS

MODEL DSG-6



*2—300 KW AC
*2—250 KW DC
*2—300 KW DC
450 HP at 450 RPM

*New

HP	Model	KVA	RPM
2—1600	General Motors 16-278A	1250	720 3/60/2300
2—1600	General Motors 16-278A	1250	720 3/60/2400-4160
1— 450	Fairbanks Morse 32-E-14	375	300 3/60/240
1— 300	Fairbanks Morse 32-E-14	250	300 3/60/240
1— 360	Fairbanks Morse YVA	300	257 3/60/2400
1— 240	Fairbanks Morse YVA	200	257 3/60/2400
*2— 240	Buckeye 80	187.5	600 3/60/240-480
1— 270	Hercules DNX	125	1800 3/60/127-220
		125	1500 3/50/230-400
*3— 90	General Motors 6016-E	75	1200 3/60/127-220
*3— 90	General Motors 6043-C	62.5	1000 3/50/230-400
*2— 45	Int. UD-14	37.5	1200 3/60/127-220
		31.2	1000 3/50/230-400
1— 79	Caterpillar D4600	37.5	1200 3/60/220-440
*4— 90	Gen. Motors 6-71RC		1200 120/240 D.C.

Diesel Motors

Port Washington, L.I., NY **CORPORATION** Port Washington 7-2000

Clean Oil makes the "CATS" BEHAVE

A midwestern pumping station has equipped all 16 of its Caterpillar diesel engines with Honan-Crane oil purifiers, and maintains continuous 24-hour schedule.

Installation of purifiers was completed January, 1945. Lube oil consumption has dropped 50% with individual engines operating 13,000 continuous hours without overhaul.

For full information on low cost purification of diesel fuel and lube oils, write to 202 Indianapolis Avenue, Lebanon, Indiana.

HONAN-CRANE CORP.
a subsidiary of
HOUDAILLE-HERSHEY CORP.

NOW AVAILABLE

NEWLY REVISED BROUGHT UP TO THE MINUTE

13th edition of the DIESEL ENGINE CATALOG

THE ENTIRE DIESEL INDUSTRY UNDER ONE COVER

Whatever you are looking for in diesel engines, or accessories, you will find them described and illustrated in the 1948 DIESEL ENGINE CATALOG, Volume 13, edited by Rex W. Wadman. What's more, you will find complete specifications on

840 DIFFERENT MODELS

The Products of 53 Engine Manufacturers. Each engine description is complete and accurate—checked and double-checked by the Manufacturer himself. Illustrations include full page engine views, lube and fuel system diagrams, also cooling systems—many traced in color. But that is just the Diesel engine section. The Catalog also includes an accessory section carrying valuable information on the various Fuel Injection Sytems, Gear and Chain Drives, Turbochargers, Blowers, all fully described and profusely illustrated.

FOR DESIGN AND OPERATING ENGINEERS AND BUYERS

There is a Market Place Section—a directory of Diesel engines classified as to ratings and speeds with manufacturers' names and addresses—and a Product Directory including accessories, parts, materials and services—all classified as to products. The Market Place tells you at a glance where to find what you want for your engine or plant.

NO OTHER DIESEL BOOK LIKE IT
Really 4 Books In One

1. The main section is devoted to descriptions, illustrations and specifications of all the Diesel engines manufactured in this Country.
2. A large section carries complete illustrated descriptions of Diesel engine and plant accessories.
3. The Market Place—a classified directory of Diesel Engines and Accessories.
4. Manufacturers' Advertisements—informative—helpful.

REVISED ANNUALLY

The most widely-used Diesel reference book published:—Because the book is revised and brought up to the minute each year, thousands of design and operating engineers, purchasing and sales executives, Diesel students buy the DIESEL ENGINE CATALOG each year and constantly refer to it throughout the year. The 1948 Edition, Volume 13, embodies sweeping changes—new models and types, revised designs, and carries the basic information published in previous editions. Whatever your interest in Diesels is you will find this Edition of the DIESEL ENGINE CATALOG indispensable.

DIESEL ENGINE CATALOG
Two West Forty-Fifth Street, New York 19, N. Y.

Enter my order today for a copy of the 1948 Diesel Engine Catalog, Volume Thirteen, Edited by Rex W. Wadman, for which I enclose $10.00, also payable at £2 10s. 0d. to E. H. Doddrell, 342 St. Paul's Corner, Ludgate Hill, London E.C.4.

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ORDER YOUR COPY TODAY *Your copy will be shipped promptly upon receipt of your order.*

President & General Manager of Cummins Sales

J. E. EVERROAD was elected president and general manager of Cummins Sales & Service, Inc., by the Board of Directors. He was previously vice president of this company. Cummins Sales & Service, Inc., are exclusive distributors of Cummins Diesel Engines in the Mid-Continent area.

J. E. Everroad

Everroad is well-known throughout the oil industry having started as a diesel engine mechanic with the Mid-Continent Supply Company in 1936. He has also been instrumental in developing up-to-date, factory-type, unit rebuild diesel repair methods for the petroleum industry, diesel trucks, cotton gins, irrigation equipment, power boats, construction and dirt moving equipment.

Cleveland Diesel Plans Plant Addition

GEORGE W. Codrington, Vice President of General Motors Corporation, and General Manager of the Cleveland Diesel Engine Division, recently announced the proposed construction of a new service parts building to be located east of the present #3 plant of the Division at 7700 Clinton Road, Brooklyn Village, Ohio. The addition will add approximately 150,000 square feet of plant capacity and will be erected at a cost of about two million dollars. The plans are being prepared by the Argonaut Realty Division of General Motors Corporation, Detroit, Michigan. It is expected that construction will be started soon.

Engineering Societies Meetings Scheduled

S.A.E. National Meetings

Aeronautic and Air Transport Meeting	Hotel New Yorker	New York, N. Y.	April 11-14
Summer Meeting	French Lick Springs Hotel	French Lick, Ind.	June 5-10
West Coast Meeting	Multnomah Hotel	Portland, Ore.	August 15-17
Tractor Meeting	Hotel Schroeder	Milwaukee, Wis.	Sept. 13-15
Aeronautic Meeting and Aircraft Engineering Display	The Biltmore Hotel	Los Angeles	Oct. 5-8
Diesel Engine Meeting	Chase Hotel	St. Louis, Mo.	Nov. 1-2

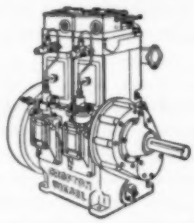
A.S.M.E. National Meetings

Oil and Gas Power Division	Hotel Sherman	Chicago, Ill.	April 25-29
Spring Meeting	Hotel Mohican	New London, Conn.	May 2-4
Semi-Annual	Univ. of Cal. Extension Bldg.	San Francisco, Cal.	June 27-30
Fall Meeting	Lawrence Hotel	Erie, Pa.	Sept. 28-30
Annual Meeting	Hotel Statler	New York, N. Y.	Nov. 27-Dec. 2

Adaptability of the

CROFTON INDUSTRIAL

10 H.P. DIESEL



It has a wide range of application

A totally enclosed vertical 4 cycle cold starting Diesel engine low power/weight ratio; compact and well constructed. All working parts readily accessible to provide for satisfactory operation and maintenance.

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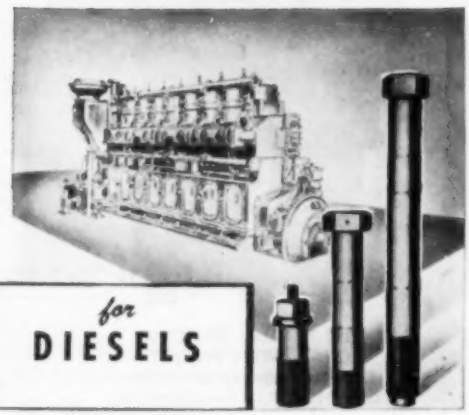
DIESEL ENGINE COMPANY

San Diego, California

ERIE SPECIAL BOLTING *for* HEAVY MACHINERY

For over 30 years ERIE has specialized in the manufacture of *high quality bolting.* We use the very latest equipment for heat treating, machining, grinding and threading. We are certain that we can produce better bolting at a saving to you because we are specialists—send us your bolting specification for our estimate.



for DIESELS

A DEPENDABLE Source of High Quality Bolting for Railroads, Refineries, Diesels, Farm Machinery, Excavating Equipment and all Types of Heavy Machinery.

ERIE BOLT & NUT CO.

ERIE, PA.

STUDS • BOLTS • NUTS ~ ~ ALLOYS • STAINLESS • CARBON • BRONZE

THOMAS
Flexible ALL METAL
COUPLINGS

Engineered to stand up on the toughest jobs, Thomas Flexible Couplings do not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.

The standard line of Thomas Couplings meets practically all requirements. But if unusual conditions exist we are equipped to engineer and build special couplings.

BACKLASH FRICTION WEAR and CROSS-PULL are eliminated NO LUBRICATION REQUIRED!

THE THOMAS PRINCIPLE GUARANTEES PERFECT BALANCE UNDER ALL CONDITIONS OF MISALIGNMENT

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THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA

D.E.M.A. Meets With Educators at U. S. Naval Experiment Station

MORE than 60 professors representing the engineering faculties of leading eastern colleges and universities attended a diesel engineering meeting jointly sponsored by the U. S. Naval Experiment Station and D.E.M.A. at the Experiment Station, Annapolis, Md., February 24. A highly interesting and informative program was presented which included a series of talks by the civilian engineers employed at the Station and personally conducted tours of the research laboratories. The purpose of this meeting was to inform the educators what is being done in the development of the diesel engine in naval operation and to offer job opportunities for the graduate engineer. The program was as follows:

9:30—Welcoming Remarks
Capt. W. D. Leggett, Jr., Director, E. E. S.
9:35—D.E.M.A. Program
Mr. Harvey T. Hill, Executive Director
Mr. Ervin L. Dahlund, Educational Director
9:55—General Description of the Internal Combustion Engine Laboratory
Mr. W. F. Joachim
10:00—Engine tests, methods and procedures
Mr. S. L. Earle
10:10—Fuel and Lubricating Oil Tests
Mr. W. E. Robbins
10:15—Laboratory instruments and instrumentation
Mr. H. V. Nutt
10:20—Job opportunities for engineers
Mr. A. H. Senner
10:30—Tours of the internal combustion engine laboratory
1:00—Luncheon
2:00—Tours of other laboratories and projects, including:
Metals laboratory
Welding laboratory
Gas turbine project
Submarine reduction gear test
Shock testing facility
Bearings testing facility

The Engineering Experiment Station is the Navy's oldest laboratory dedicated to the solution of the problems connected with the machinery for driving and operating naval vessels. These problems are as numerous and as varied as are the types of main propulsion machinery, auxiliaries and equipment installed on the Navy's ships and small craft, and include the following:

The chemistry of fuels, lubricants and machinery parts.

The determination of metallurgical requirements and the availability of metals and materials to meet these requirements.

The solution of welding problems and procedures involved in the fabrications of machinery, machinery foundations and even the ship's hulls. The reduction of machinery noise and vibrations to tolerable limits.

The approval testing of all designs of internal combustion engines, gas turbines and auxiliary machinery for both steam and diesel driven vessels plus such development work as is required to adapt this machinery to particular naval applications.

The work connected with these problems is usually performed in the station's six major laboratories supported by many well-equipped shops.

Water Systems

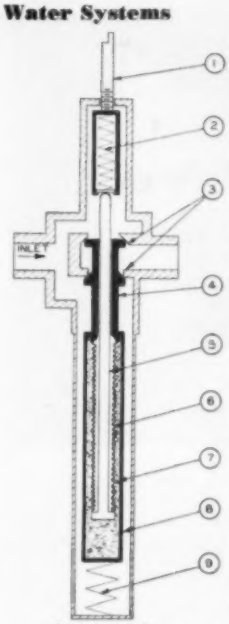


Diagram of Sarco TR-54-R Regulator

A NEW design of self-operated, rigid stem type temperature regulator for limiting the flow of cooling water through engine and compressor jackets, hydraulic presses, vapor degreasers, condensers, etc., to maintain constant temperatures has been announced by Sarco Co., Inc. The operating principle of this regulator is the difference in compression strength of two springs, 2 and 9, and the thermal expansion and contraction within a tube or bellows 6. When heat is applied to the thermostat, expansion of the oil and compression of the bellows lengthens the thermostatic member. As it does not compress the relief spring 2, it forces downward the thermostat casing 8 to which the valve stem is attached, thus, it opens the valve. When the thermostat cools, operation is reversed and valve closes. This system is closely balanced, has double seated valves, and provides control without danger of sticking or chattering. A separable socket allows regulator to be removed for inspection without interrupting operation.

Manager of Parts For Baldwin

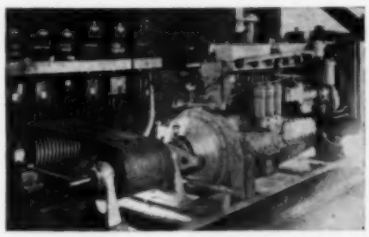
R. B. Crean, who has been associated with the Baldwin Locomotive Works since 1943, has been appointed manager of a newly-created Diesel Renewal Parts Department, it is announced by R. Nevin Watt, Baldwin vice president in charge of sales.

The new department was formed to render a complete service in renewal parts, particularly to the company's railroad customers. The department will include sales and warehousing of all Diesel renewal parts, both in the field and in the company's headquarters at Eddystone, Pa.

Elliott Company Elects Quentin Graham

QUENTIN GRAHAM has been elected a vice president of Elliott Company. He joined Elliott in 1944 as manager of the electrical engineering department and in 1946, he was appointed manager of the Ridgway Division.

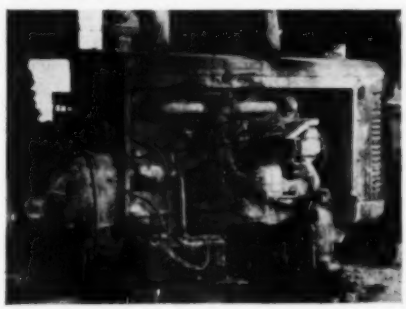
Diesel Driven Lumber Company



Caterpillar diesel which drives lumber company's equipment.

TWENTY-EIGHT hundred feet above sea level, at Bridgeville, California, where summers are hot and dusty and winters cold and wet, "Mack" Savers and Paul Zielke own and operate the Butte Creek Lumber Co. The 25 hp. log turner unit, edger, slab conveyor, green chain, trim saw and blower of the mill are operated from power furnished by a "Caterpillar" D13000 Diesel Electric Set. The 50 in. top saw of the mill's insert tooth circular saw set is sharpened once a day while the head saw is ground four times daily. The Butte Creek Lumber Co. produces between 20,000 and 25,000 bd. ft. of pine and fir lumber per day.

Diesel Cuts Clay Plant Costs



International 100 hp. diesel engine.

CLAY PRODUCTS CO. has found the answer to low cost power for operating a small clay and cement products plant by purchasing a 100 hp. International diesel engine. This engine operated 16,000 hours at a total repair cost of $1.75, between August of 1941 and last November, and at a fuel bill so negligible that the owner says, "With the savings over our former costs secured with this engine, I could afford to buy a new one every year and throw it away after a year's use."

The diesel pulls all the machinery in the plant, including a clay mixer, concrete block machine, and a concrete mixer.

New Distributors for Diamond

THE Diamond Chain Company, Inc., manufacturer of roller chains, sprockets and flexible couplings, have announced new distributors for their products. They are the Apex Power Equipment Co., 4047 West 26th St., and Ray M. Ring Co., 1234 West Washington Blvd., both of Chicago. The company has also named W. F. McGraw & Co., 575 E. Milwaukee St., Detroit, as the distributor for that area.

Blooming Prairie Cooling Tower by Diesel Service Co.

Forced draft cooling tower at Blooming Prairie is designed to adequately cool the jacket water of all engines installed. Jacket water is softened and cooled by passing through copper tube heat exchangers within the tower. It is equipped with three fans for flexibility of control. All raw water piping directly at tower. Diesel Service Cooling Towers offer maximum economy at minimum attention . . . more cooling with less area . . . no windage loss . . . no ice formation . . . no algae. They are flexible for changing weather conditions and offer uniform temperature control. INDIVIDUALLY ENGINEERED and guaranteed to fit your requirements.

PERMANENT FILTER NO CARTRIDGE REPLACEMENT

The SENTINEL FILTER

proved by more than ten years industrial use. Highest efficiency —simplicity of operation— VIRTUAL ELIMINATION OF MAINTENANCE EXPENSE—reasonable initial cost. Filters heavy crude oils to lightest naptha, solvents, gasoline, etc. Automatically cleaned in a few minutes with air pressure. Permanent filter—no cartridge replacement required. Send coupon for details.

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COOLING TOWERS — DOUBLE SEAL PISTON RINGS — RENUOIL PURIFIERS — FUEL & LUBRICATING OILS — MISC. SUPPLIES

APPLIED EXPERIENCE For Trouble-Free, Economical DIESEL OPERATION

Diesel Service Company offers thirty years practical operating and engineering experience in the selection, design and application of its products. Cooperation with plant managers is consistently providing more economical and trouble-free diesel operation for our customers. Our suggestions are made only after careful study . . . all articles supplied are DEFINITELY GUARANTEED to perform to your satisfaction the purpose for which they are recommended.

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Diesel Service Co., Ames, Iowa
Please send information about .....

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ADDRESS .....

Whatever Your Type of Diesel . . .

Specify *Bendix Starter Drive* For More Economical Installations!

There are several definite factors responsible for Bendix* Starter Drive economy: Its simple design lets you mount the starting motor more easily and in more positions. It requires no actuating linkage—has fewer parts—needs fewer adjustments. The solenoid may be mounted in any convenient position. No other starter drive made can match these economy advantages! So whatever your type of Diesel, specify Bendix Starter Drive for economy and all-around performance.

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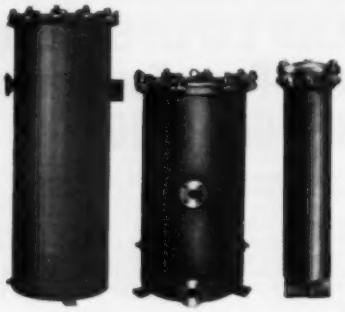
Bendix AVIATION CORPORATION

MICHIANA
OIL FILTERS

• ENGINEERED FOR MODERN ENGINES
• PRACTICAL
• ECONOMICAL

They Pay for Their Cost Over and Over Again



No One Accessory Does More For Engine Life and Performance Than a *Good* Oil Filter.

MICHIANA PRODUCTS CORPORATION
Michigan City, Indiana

HEMPHILL

trains men for the diesel industry

Special effort to supply the right man for the right job.

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LIQUIDATING
FOR SALE

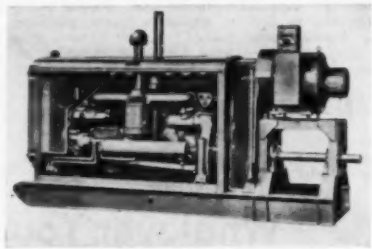
1—450 HP 32-E14-6 cyl. Fairbanks-Morse Engine Direct Connected to 375 K.V.A. Alternator 4160 or 2400 Volt 3 Wire. Switch Board, Evaporative Cooler and all auxiliaries complete with pipe and fittings. Engine installed November 1945.

Mendota Light & Power Co., R. 1, St. Paul 7, Minn.

International Harvester Booklet Describes Four-Fuel Carbureted Engines

INDUSTRIAL engines and equipment for their operation on gasoline, kerosene, distillate or natural gas in a wide variety of applications, are described and shown by International Harvester Company in a new 12-page catalog covering four carburetor-type engines. Models presented are available as stripped engines or with job-determined equipment combinations up to complete power unit. Maximum working horsepower ratings range from 24 to 55 for power units complete with fan, radiator, air cleaner, governor, when operating on gasoline. Illustrations show job-adapted units suitable for such work as pumping crude in the oil fields or water for irrigation, powering sawmills, rock crushers, cotton gin equipment, compressors, feed mills—even carnival thrill rides. Specifications and dimensions are given for each of the four engines. Copies of the booklet, A-164-MM, "International Carbureted-Type Engines and Power Units," are available on request from International Harvester Company, 180 N. Michigan Ave., Chicago 1, Ill.

New Murphy Diesel Unit



Mechanical and electric Murphy diesel unit.

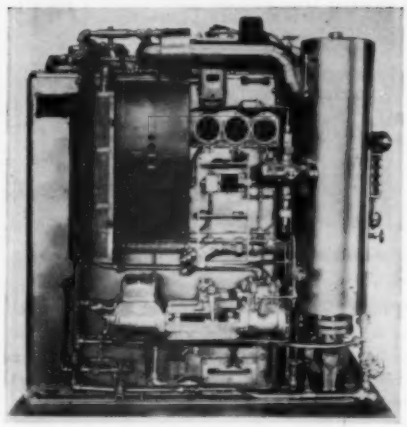
WHAT is believed to be the first "packaged" diesel power unit capable of providing both electricity and mechanical driving power simultaneously has been announced by the Murphy Diesel Company, who call their new power plant, the MECH-ELEC Unit. Any fixed or variable proportions of mechanical and electrical loads can be handled providing the combined total does not exceed the rated capacity of the engine and that the electrical load does not exceed 50 kw. Generator can be operated without engaging mechanical drive.

Two models are currently available, the Model ME-6, rated at 135 hp. continuous, 160 hp. intermittent and the Model ME-66, rated at 150 hp. continuous, 180 hp. intermittent. Both models are equipped with 50 kw. generators. The engine ratings indicate the total power available for mechanical output.

New Vice President of Jessop Steel Co.

MILES K. SMITH has been appointed Vice-President and Technical Director of Jessop Steel Company, Washington, Pa. He was formerly with the Molybdenum Corporation of America in a technical sales capacity, and prior to that he was employed for many years by the Latrobe Electric Steel Company in the production of tool steels.

Elesco Steam Generator



Elesco forced recirculation steam generator

THIS Elesco generator is for train heating, particularly as applied to diesels; fully automatic in operation, it employs a special type of forced recirculation. A motor driven pump circulates water through steam generating elements at a rate ten times maximum steam output, reducing scale accumulation. The recirculation pump takes water from a steam separator and discharges it into an inlet header into which several steam generating elements connect, insuring proper distribution of water. A standard reciprocating feed pump discharges makeup feedwater into an outlet header where the water is heated to steam temperature. This header discharges dry saturated steam along with oxygen and other gases liberated, and the water flows by gravity to the recirculation pump.

The steam generator is oil fired, the amount of fuel being regulated by a valve in response to the generator steam pressure. In addition to safety valves, safety devices are provided to automatically shut down the steam generator if the steam pressure rises above, or the water level drops below predetermined limits, or if the recirculation rate is low, or the flame goes out.

Diesel Delivery

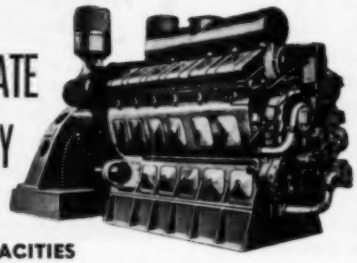
A coal mine of the Pikeville Coal Company at Pikeville, Tenn., makes effective use of a Diesel power unit to speed coal on its way to Europe. Twenty-four tons an hour are brought out of the mine by this 53-horsepower International diesel driving a Street Brothers double drum winch. Here, 12 loaded cars, each of 2200-pound capacity, reach the end of a trip to the surface. Loaded cars are hauled out every 30 minutes on a 1300-foot length of cable. The same hauling unit returns the empties to the digging site by means of a 2600-foot cable, which runs down into the mine on overhead pulleys and is paid out as the cars are pulled up.

DIESEL GENERATOR SETS

FOR

IMMEDIATE

DELIVERY



UNIT CAPACITIES
10 TO 1420 KVA

A.C. 50 AND 60 CYCLES
ANY VOLTAGE

Write or wire today for bulletins and complete information regarding these fine fully guaranteed DIESEL ENGINE GENERATING UNITS.

AG SCHOONMAKER CO INC.
54 CHURCH STREET NEW YORK 7, NEW YORK

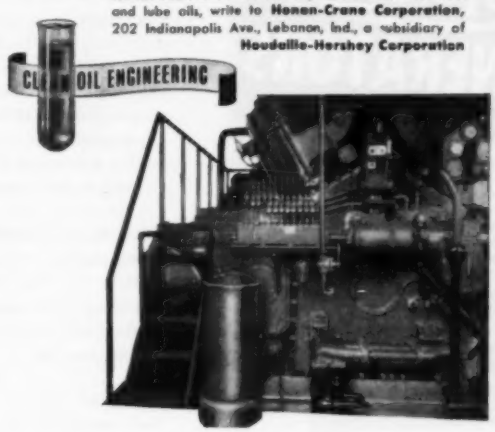
THE Continental Oil Co.

uses HONAN-CRANE

On the Driscoll Ranch at Benonides, Texas, The Continental Oil Company operates a 375 hp Cooper-Bessemer gas engine equipped with Honan-Crane oil purifier to insure clean lube oil.

In the oil industry, Honan-Crane purifiers are chosen where continuous operating conditions are required. Clean oil eliminates excessive engine maintenance and down time.

For full information on low cost purification of diesel fuel and lube oils, write to **Honan-Crane Corporation,** 202 Indianapolis Ave., Lebanon, Ind., a subsidiary of **Houdaille-Hershey Corporation**



Just Out

Supercharging The Internal Combustion Engine

By E. T. Vincent
Professor of Mechanical Engineering
University of Michigan

323 pages, 6 x 9, 167 illustrations, $5.00

This book contains the essential fundamental theory of the various forms of superchargers and turbo-superchargers, together with a treatment of their effects on engine cycles, power outputs, and thermal efficiencies. The emphasis is on the fundamentals of the thermodynamics and mathematics involved in solving problems of supercharging.

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Please send me a copy of Vincent—SUPERCHARGING THE INTERNAL COMBUSTION ENGINE for 10 days' examination on approval. In 10 days, I will remit $5.00, plus few cents postage, or return book postpaid.

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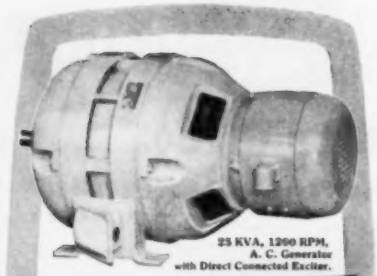
STANDARD MODELS IN STOCK

CUSTOM MODELS TO YOUR ORDER

The **UNION DIESEL ENGINE** *Co.*
2200 EAST SEVENTH STREET
OAKLAND 6, CALIFORNIA, U.S.A.



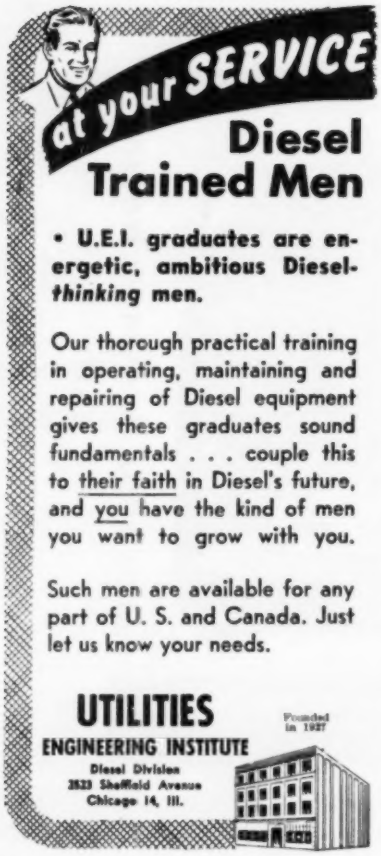
COLUMBIA

GENERATORS

A.C. and D.C.

Columbia, with its years of experience, brings to you a wide line of performance proved, sturdily built, A.C. and D.C. Generators. A.C. Generators: 6¼ to 375 KVA. D.C. Generators and Exciters: 2 to 200 KW. Available in Single or Two Bearing Construction. *Write today for information. Our engineers will be glad to review your requirements. Prompt delivery.*

COLUMBIA ELECTRIC MFG. CO.
4519 Hamilton Ave., Cleveland 14, Ohio



Diesel Trained Men

• **U.E.I. graduates are energetic, ambitious Diesel-*thinking* men.**

Our thorough practical training in operating, maintaining and repairing of Diesel equipment gives these graduates sound fundamentals . . . couple this to their faith in Diesel's future, and you have the kind of men you want to grow with you.

Such men are available for any part of U. S. and Canada. Just let us know your needs.

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ENGINEERING INSTITUTE
Diesel Division
3523 Sheffield Avenue
Chicago 14, Ill.

Founded in 1927

West Coast Diesel News

By FRED M. BURT

THE heaviest catch on record, 1050 tons of herring taken in one set in British Columbia waters, was made by the *Western Warrior,* Capt. Martin Magnussen, a 78-ft. powered with a 200 hp. Atlas Imperial diesel, using a purse seine 1¼ in. mesh about 2600 meshes deep.

POWERED with a 55 hp. General Motors diesel, purchased from Shoreline Diesel Maintenance Co. through West Coast Engine & Equip. Co., Berkeley, Calif. is the new combination boat *Gioconda,* built by Genoa Boat Works, Fishermen's Wharf, San Francisco.

THE 183 ft. *Oregon Pacific,* a converted fleet repair tug, diesel-electric driven by four 440 hp. Cooper-Bessemer diesels hooked to generators, will be operated as a refrigerated freezer-ship by the newly incorporated Oregon Pacific Fisheries; Graham Barbey, Astoria, is president.

TWO Hendy D38-MR3 8 cyl., 265 hp. marine diesel engines: one from Enterprise Engine & Foundry Co., San Francisco to Ernest Dobzinski, Seattle for a re-powering job; and the other from Alaska Pacific Supply Co., Seattle to Wards Cove Packing Co., for use in Alaska.

CONVERTING a 1651 ATR for shark fishing, Nick Dragich of San Pedro has powered the boat with a 1600 hp. opposed piston Fairbanks-Morse diesel; two 165 hp. Superior diesels for auxiliary power.

THE new Seattle office and warehouse of Twin Disc Clutch Co., located on Lake Union in a new building, is designed to give a maximum of service and parts for the area served by this branch: Oregon, Washington, Idaho, Montana, British Columbia, and Alaska.

ANDERSON & Cristofani, San Francisco boatbuilders are converting APC 110, powered with a 400 hp. Enterprise diesel, into a sharker-trawler for William Furlong, lately a towboat operator on San Francisco Bay.

SUPPLIED by Shepherd Tractor & Equipment Co. a new D311 "Caterpillar" diesel is going into a new refrigeration plant in Los Mochis, Sin., Mexico, to power an ammonia compressor.

AN ALL-PURPOSE, 44 ft. fishing boat, 15 ton capacity, powered with a GM 165 hp. diesel is under construction for Orlando Bros., San Diego by Delford Boyce, boatbuilder of that city.

ACCORDING to the local newspaper, the largest crowd ever present at an event of the kind in Orange County, attendance 1250, witnessed the

≡NEW≡
PETROMETER
FOR ALL TANKS
FOR ALL LIQUIDS
FOR ALL DEPTHS
FOR ALL DISTANCES
PETROMETER CORPORATION
9 STAR SQUARE LONG ISLAND CITY 1, N. Y.

It pays to specify . . .
THE LANOVA COMBUSTION SYSTEM*

The controlled rotary turbulence of the Lanova Combustion System gives a Diesel many advantages, such as:
- High combustion efficiencies
- Smooth, powerful push of working pressures on pistons
- Elimination of jarring combustion pressure knocks
- Clean exhaust and easy starting

Be combustion-wise and economize. Specify Lanova in your next Diesel.

Lanova Corporation, 38-19 30th St., Long Island City 1, N. Y.

*Available only in Diesels manufactured by Lanova licensees. Send for names of these leading engine builders.

THE HEART OF THE DIESEL

LANOVA *makes Diesels purr*

The Experience Resulting from 85 Years Devoted Exclusively to the Design and Application of Both Plain Mechanical and Hydraulic Types of Governors Is Available When You

SPECIFY PICKERING FOR YOUR ENGINES

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Give Through your Red Cross

1949 FUND

SURPLUS ENGINES—GENERATORS
Off LSMS LSTS LCIS Marine Equipment
IMMEDIATE DELIVERY

GM 16-278A 1800 HP Air Clutch	$15,000.
GM 12/567 900 HP, 2½ to 1 Red Gear	11,000.
New Never Used Washington Diesels, with spares, 600 HP at 277 RPM, pair	60,000.
GM 8-268A 500 HP, 2½ to 1 Red Gear	6,500.
GM 6-71, 200 HP, 1½ to 1 Twin Disc	1,500.
GM Quads, 900 HP, (4, 6-71s)	4,500.
GM 2-71 20 KW DC Generators & Board	1,250.
GM 6-71 30 KW AC Skids and Radiator	2,000.
Caterpillar 30 KW AC Skids & Rad	2,500.
New 2 to 1 Westinghouse Reduction Gears for 1800 HP 720 RPM Diesels	5,000.
200 HP AC Electric Motor and starter	1,250.
LST VESSELS COMPLETE UNRESTRICTED	CALL

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JEFFERSONVILLE, IND.

formal opening of Shepherd Tractor & Equipment Company's new Santa Ana, Calif., complete sales, parts and service branch, Manager is Roger Lindsley. Of modern architectural design, the 30,000 sq. ft. building on a 4 acre plot, is located at the only point in the county where two main highways intersect at a railway spur.

THE 65 ft. boat *Marty*, powered with a 500 hp. GM diesel, with GM auxiliaries, chief engineer R. E. Morris, delivered from San Francisco to owner Senator Gamboa of Venezuela, will be used for towing in the Caribbean.

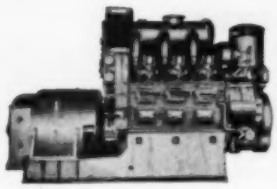
MAURICE OAKSMITH'S Alaska Engine & Equipment Co., has been appointed Alaska dealer for Cummins marine diesels; the company is also distributor for Nordberg marine gasoline engines and handles Exide batteries, Twin Disc equipment and Pan American radios.

A NEW 110 ft. wooden tuna clipper laid down by San Diego Marine Construction, designed by E. P. Johnson, will have a 600 hp. GM diesel, 2½:1 Falk reduction gear, three 60 kw. 6 cyl. GM diesel auxiliaries, Baker refrigeration plant, all brine.

THE Trico Electric Cooperative of Tuscon has a new power plant at Marana, Arizona for irrigation and lighting, using five model 80GX8 8 cyl. 14½ x 20, 1440 hp. @ 360 rpm, duel fuel Superior engines, direct connected to 1200 kva., 2400 volt Ideal generators.

AN EXPLORATION of mid-Pacific tuna areas by Hawaiian Tuna Packers, Ltd. is using tuna clipper *Hawaiian Tuna*, Capt. Wm. Borthen, cruising range 7,000 miles at 10 knots, capacity 260 tons frozen tuna, powered with a 560 hp. Union diesel.

INSTALLATIONS of "Caterpillar" diesels during 1948 in Humboldt Bay craft by Brizard-Mathews Co., Eureka, Calif., local representative, include—*Verona*, 77 hp., *Amak*, 135 hp., *Cleone*, *Mary C.*, *Queen City*, *Madaket* each 65 hp., *Rainbow*, 120 hp., *Liberty*, *Quest*, *Ranger*, and *Empire II*, each 115 hp. mostly under supervision of manager of the department, Walt Wilkins who took a course in the work at the main Caterpillar plant.



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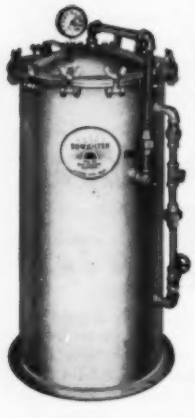

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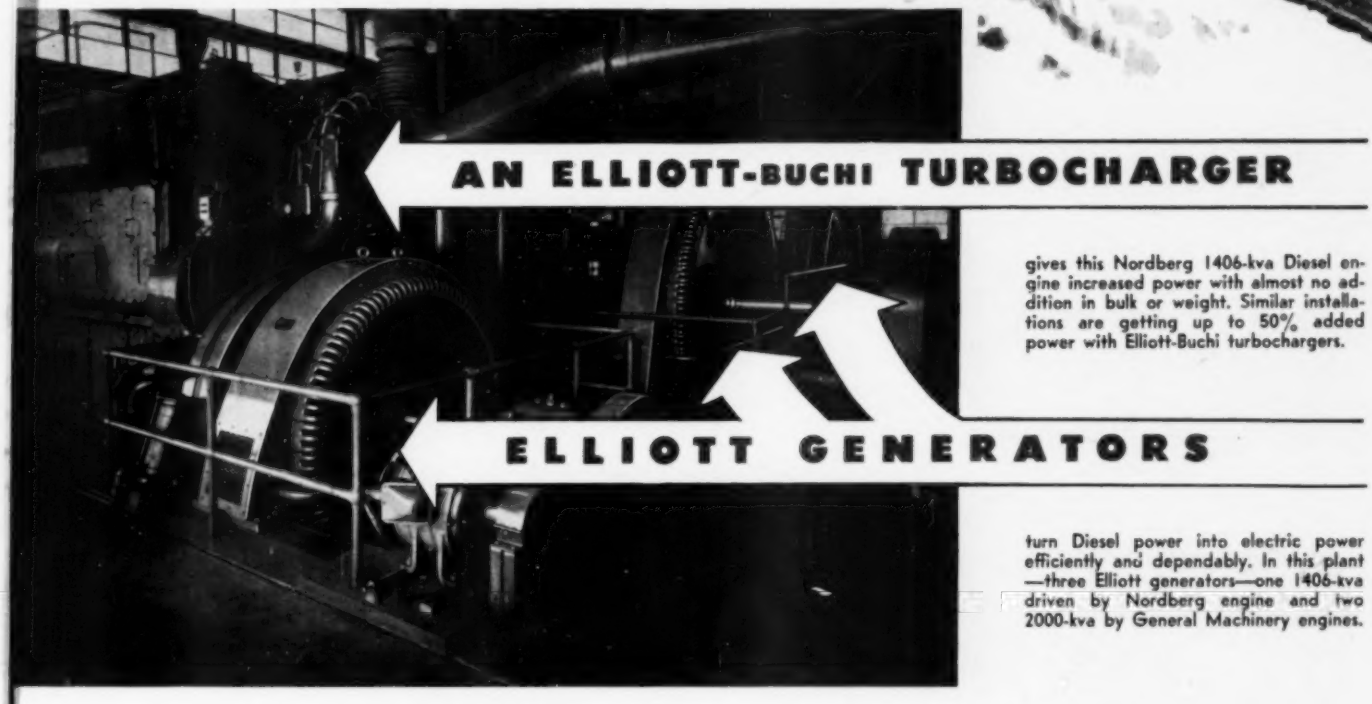

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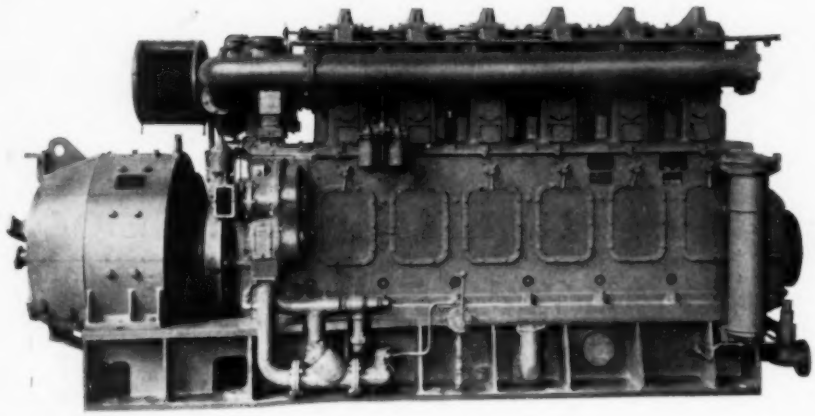

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